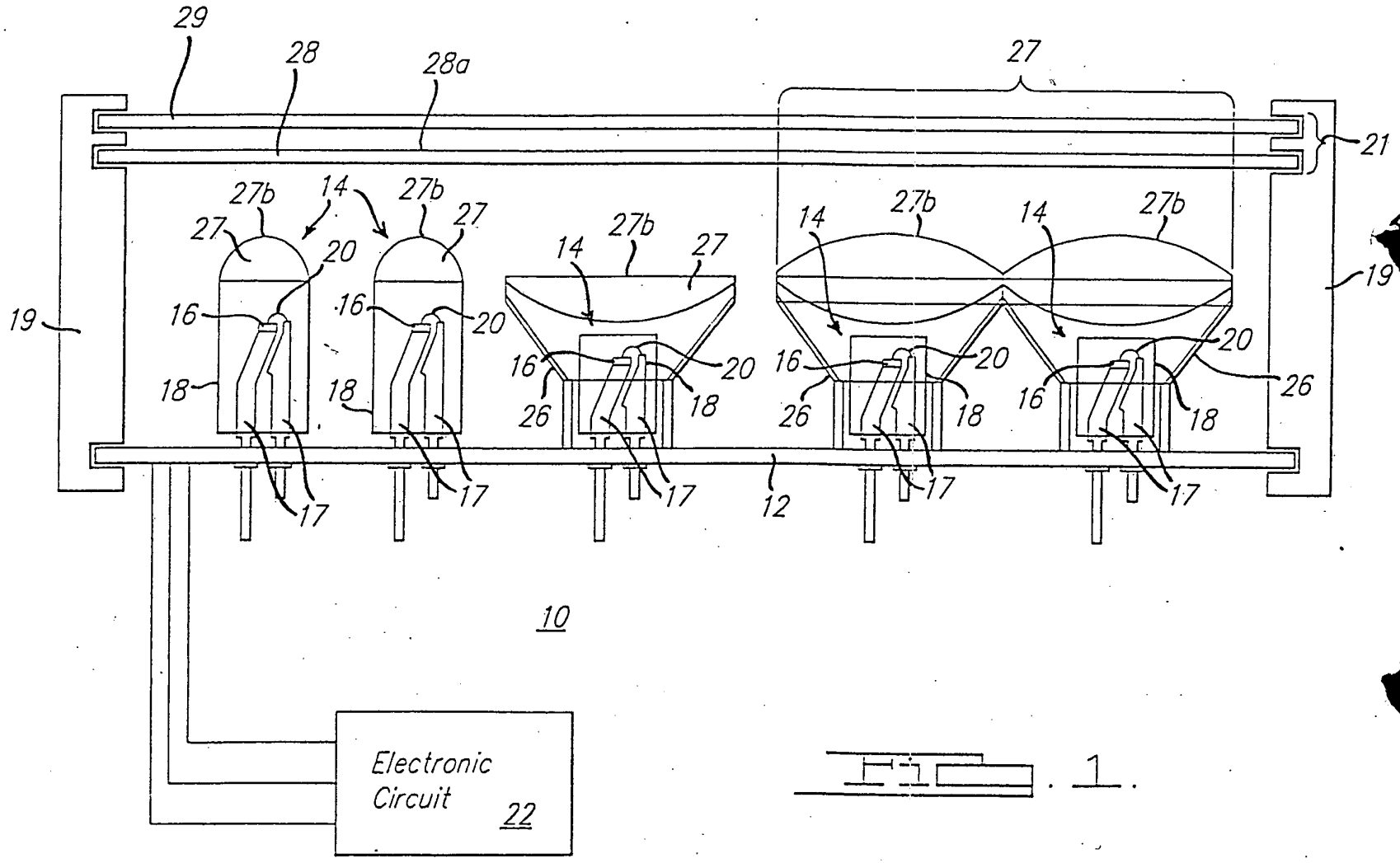


FIG. 1.

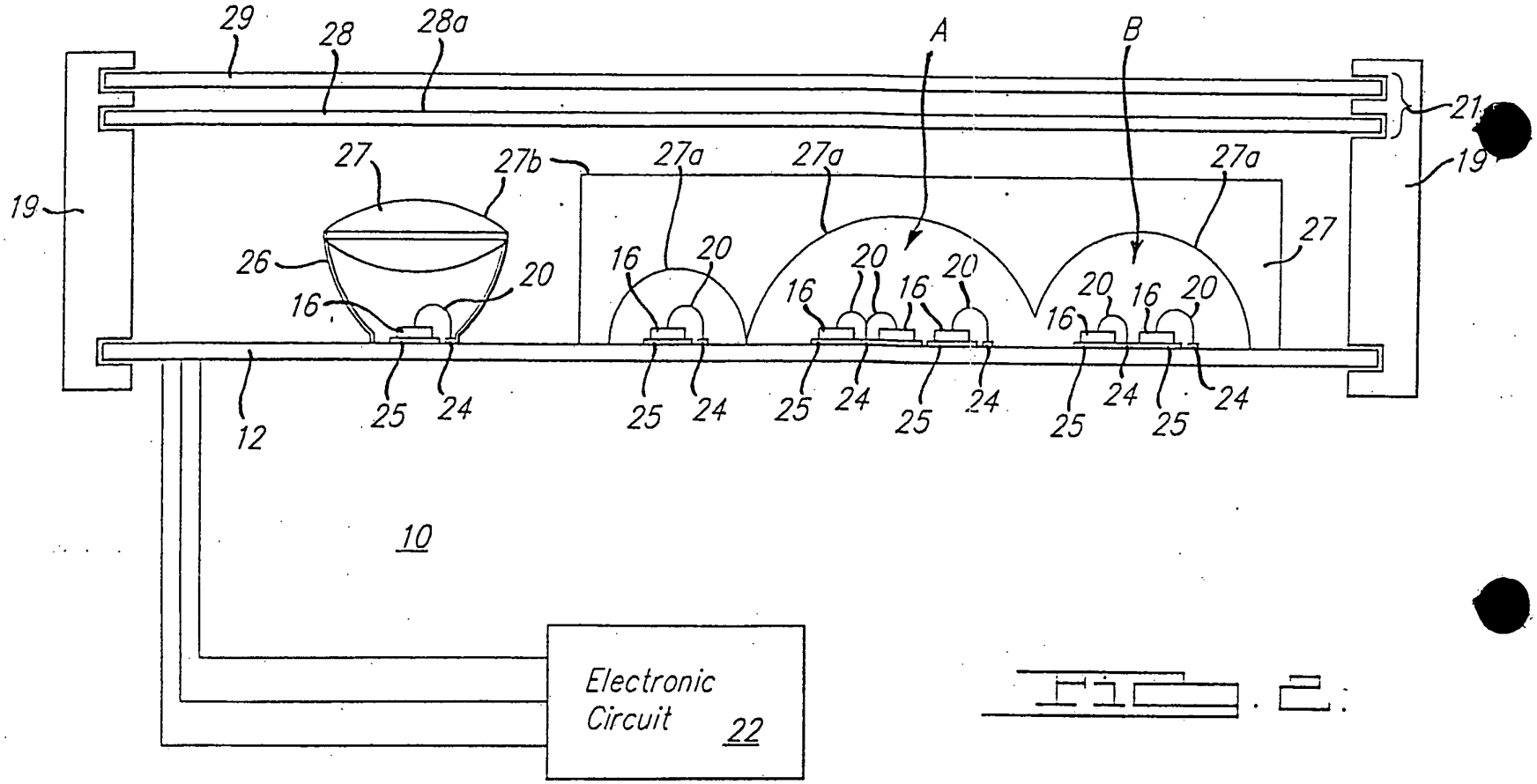


Fig. 2.

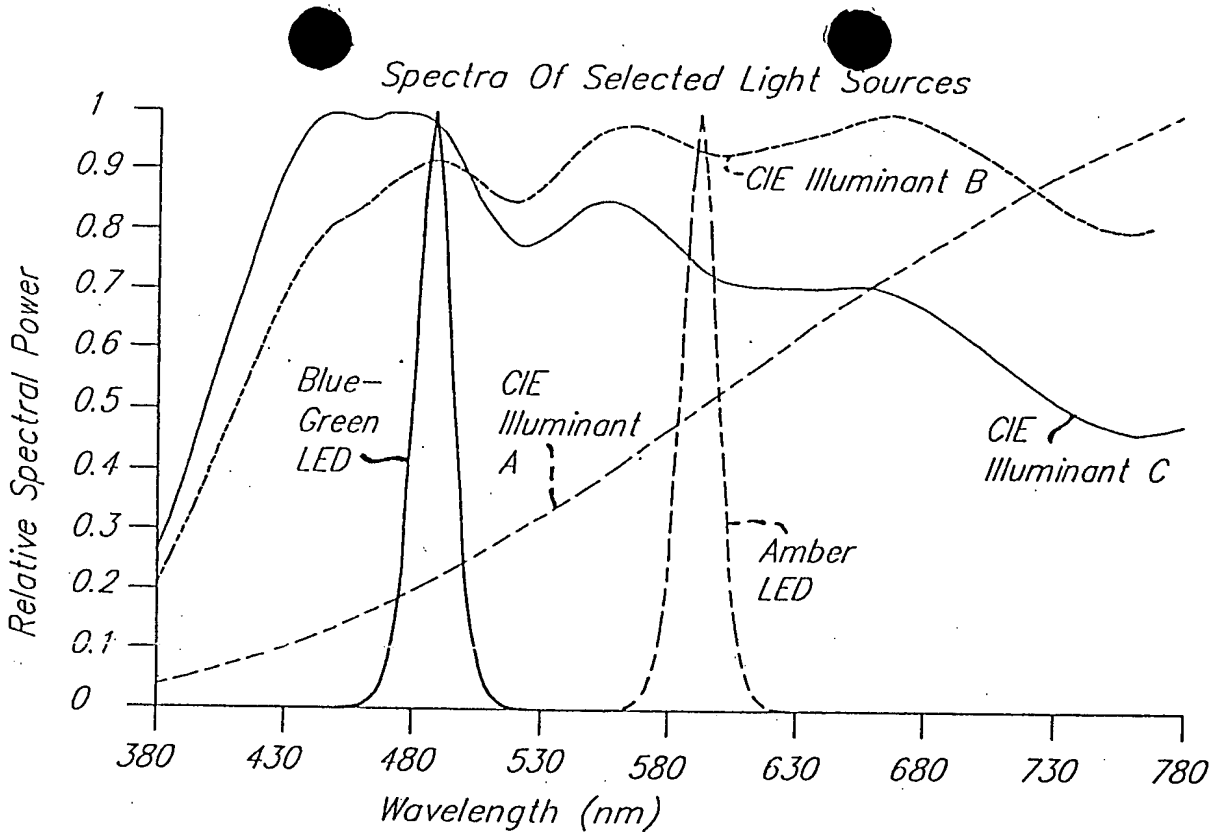

Spectra Of Selected Light Sources
Relative Spectral Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
CIE Illuminant B
Blue–
Green
LED
CIE
Illuminant
A
CIE
Illuminant C
Amber
LED
380
430
480
530
580
630
680
730
780
Wavelength (nm)

Fig. 3.

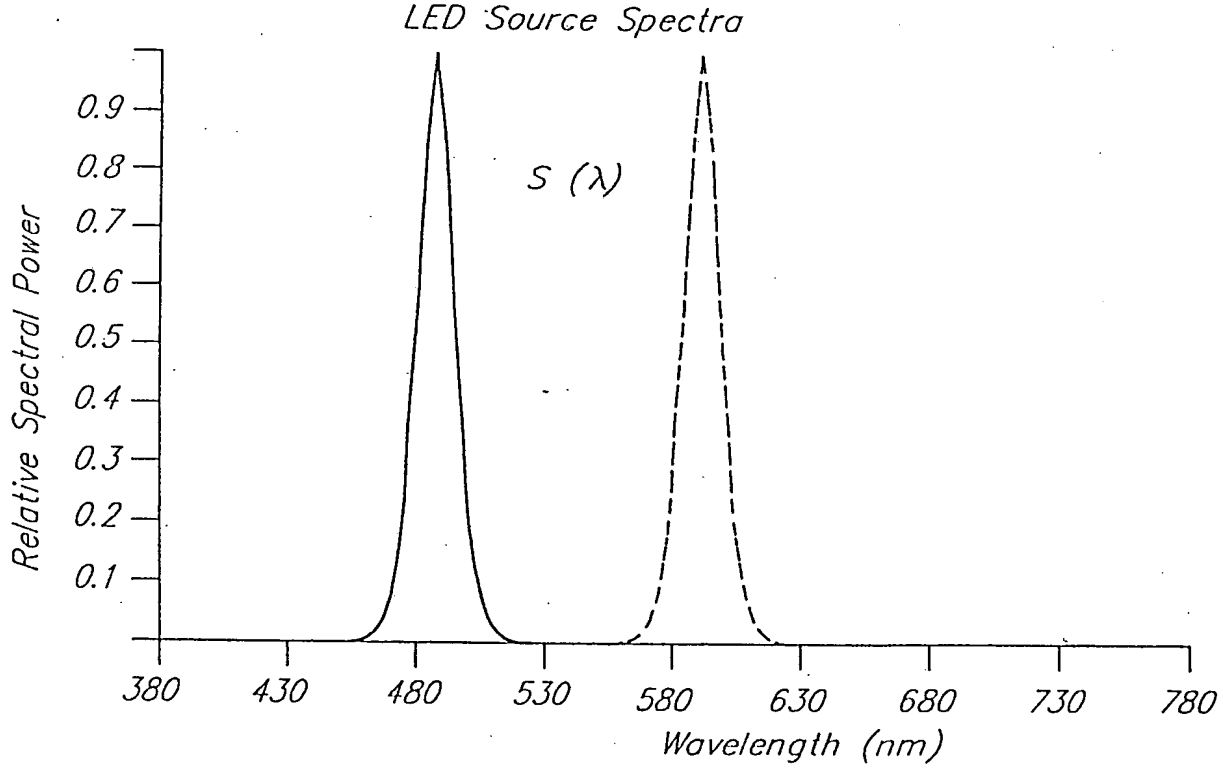

LED Source Spectra
Relative Spectral Power
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
S (λ)
380
430
480
530
580
630
680
730
780
Wavelength (nm)

Fig. 4A.

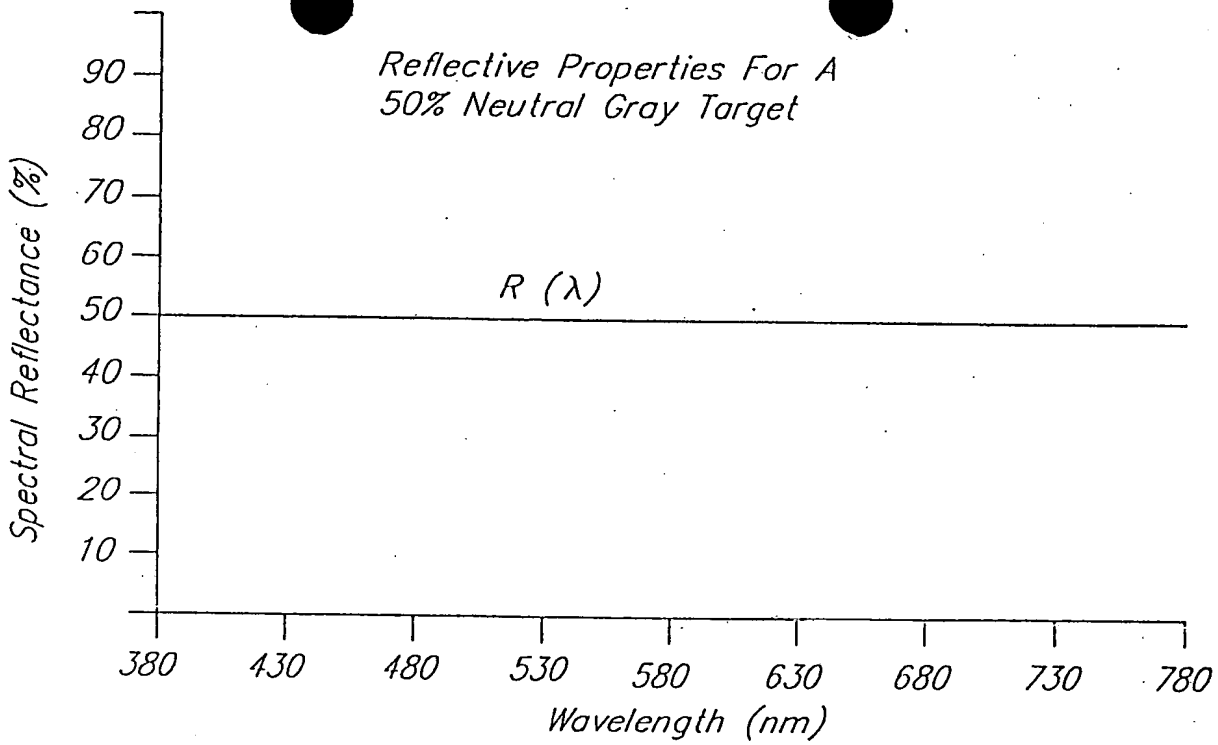

Reflective Properties For A
50% Neutral Gray Target
Spectral Reflectance (%)
90
80
70
60
50
40
30
20
10
R (λ)
380
430
480
530
580
630
680
730
780
Wavelength (nm)

Fig. 4B.

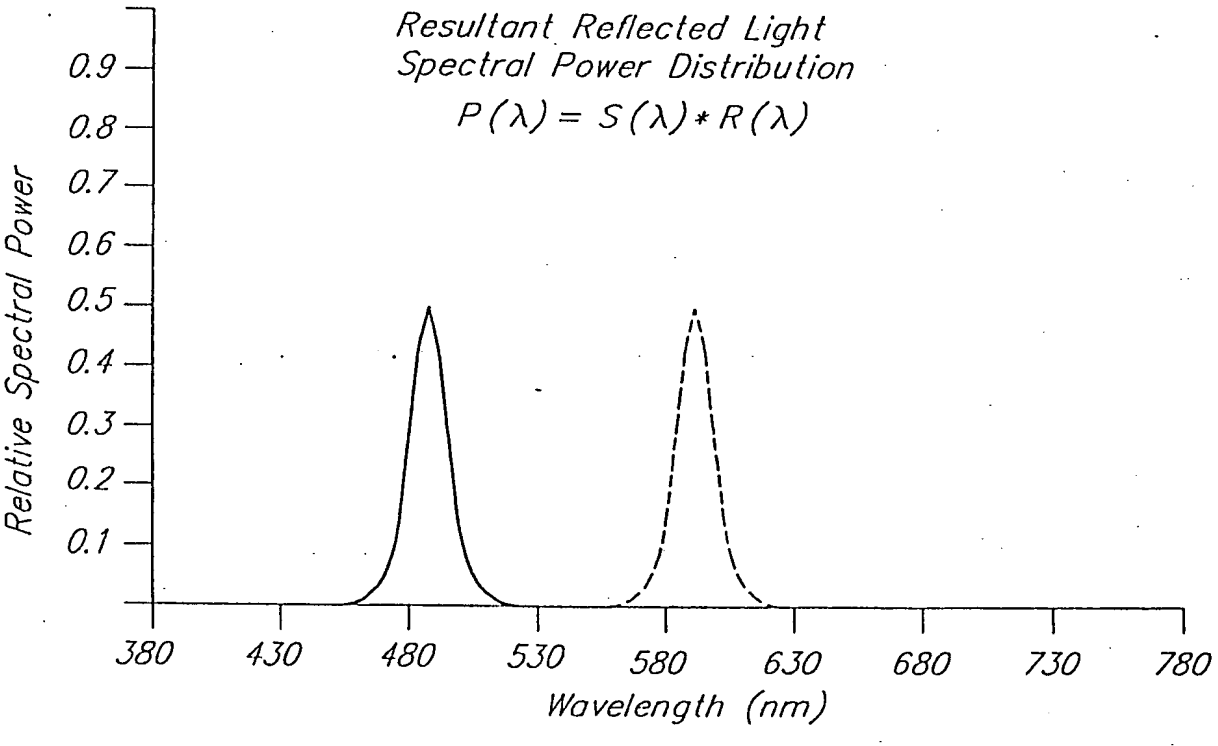

Resultant Reflected Light
Spectral Power Distribution
P(λ) = S(λ) * R(λ)
Relative Spectral Power
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
380
430
480
530
580
630
680
730
780
Wavelength (nm)

Fig. 4C.

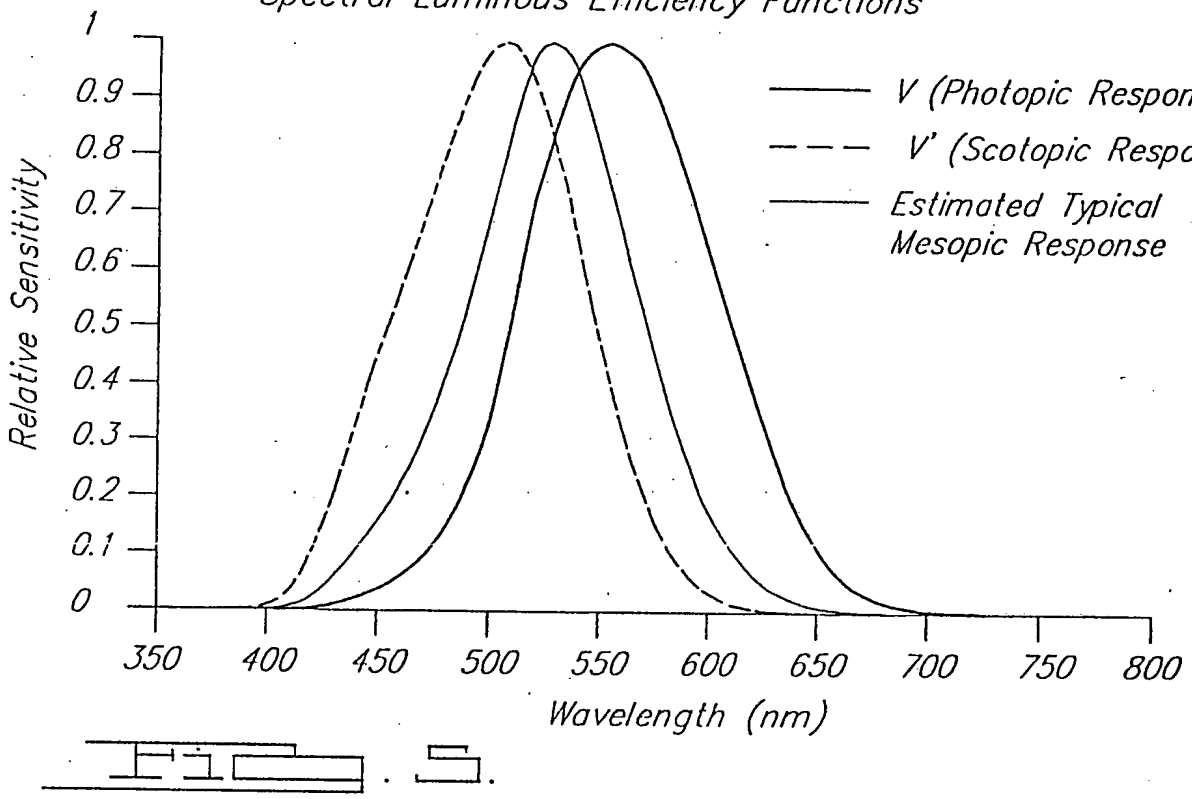

Spectral Luminous Efficiency Functions
Relative Sensitivity
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
350
400
450
500
550
600
650
700
750
800
Wavelength (nm)
V (Photopic Response)
V' (Scotopic Response)
Estimated Typical Mesopic Response

Fig. 5.

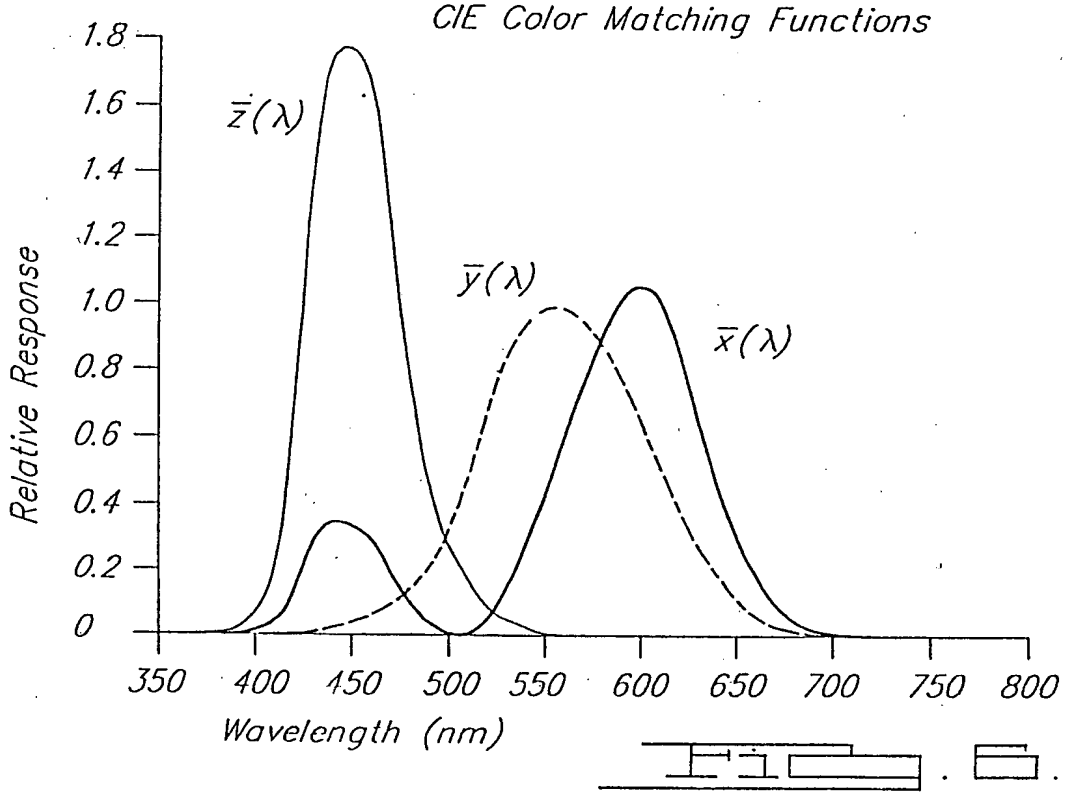

CIE Color Matching Functions
Relative Response
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
350
400
450
500
550
600
650
700
750
800
Wavelength (nm)
$\bar{z}(\lambda)$
$\bar{y}(\lambda)$
$\bar{x}(\lambda)$

Fig. 6.

CIE 1976 UCS DIAGRAM
Additive Mixture Of Two Hues From High Intensity LED's To Make An Illuminator Or Indicator With A 3d Perceived Hue (Non-white)

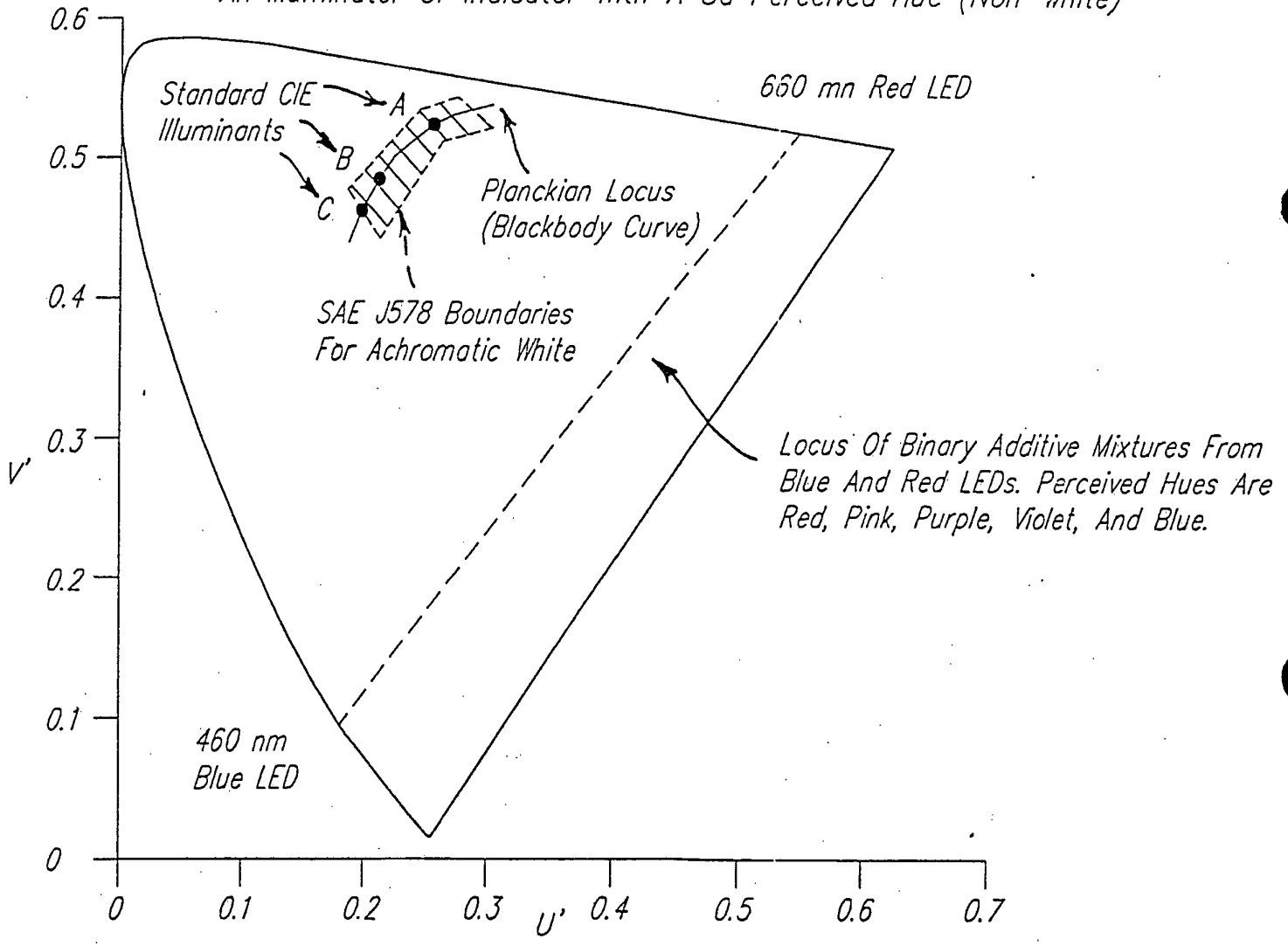


Fig. 2.

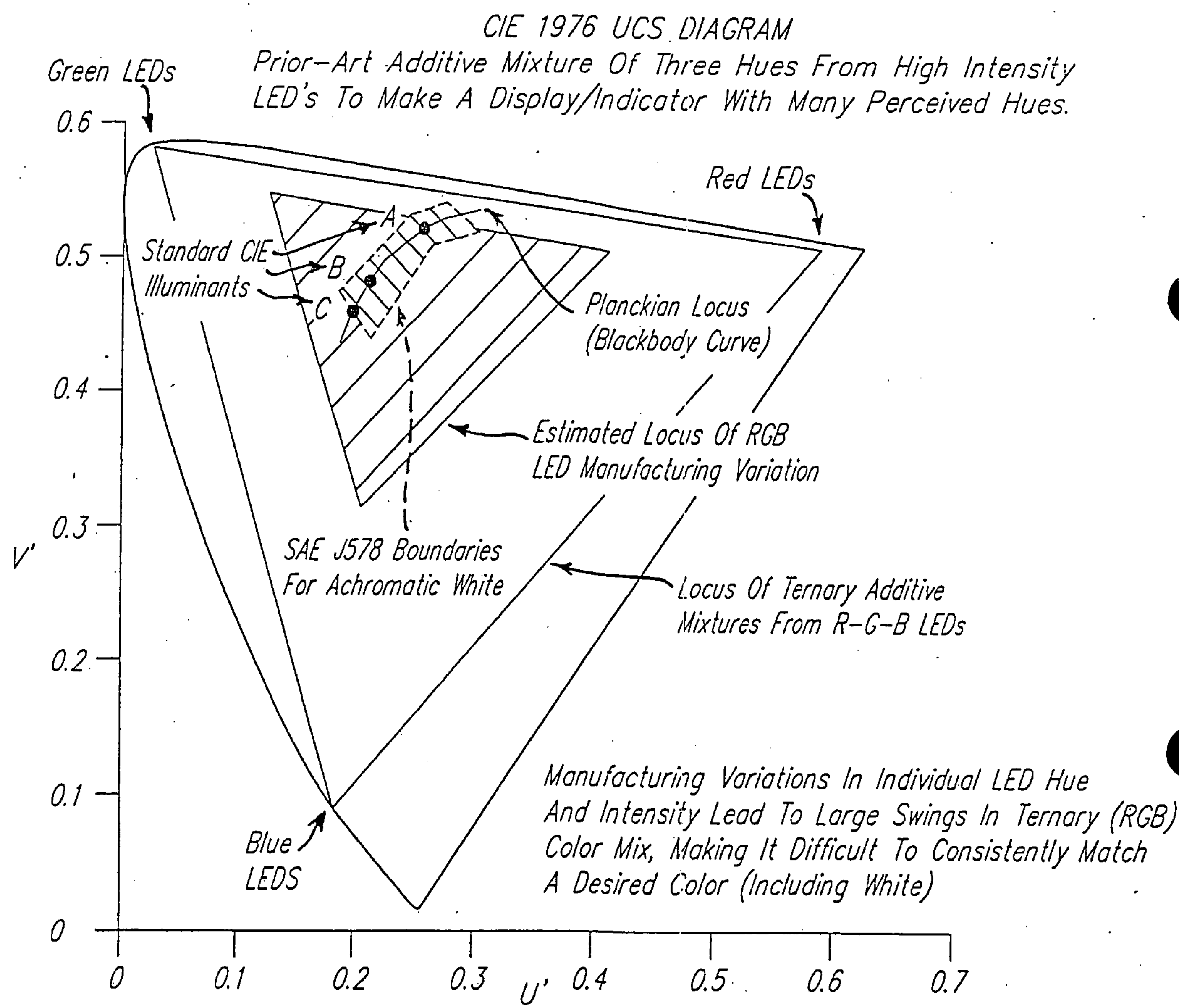

CIE 1976 UCS DIAGRAM
Prior–Art Additive Mixture Of Three Hues From High Intensity LED's To Make A Display/Indicator With Many Perceived Hues.
Green LEDs
Red LEDs
Standard CIE Illuminants
A
B
C
Planckian Locus (Blackbody Curve)
Estimated Locus Of RGB LED Manufacturing Variation
SAE J578 Boundaries For Achromatic White
Locus Of Ternary Additive Mixtures From R–G–B LEDs
Blue LEDS
Manufacturing Variations In Individual LED Hue And Intensity Lead To Large Swings In Ternary (RGB) Color Mix, Making It Difficult To Consistently Match A Desired Color (Including White)
V'
0.6
0.5
0.4
0.3
0.2
0.1
0
0.1
0.2
0.3
U'
0.4
0.5
0.6
0.7

FIG. 8.

CIE 1976 UCS DIAGRAM

Additive Mixture Of Two Hues From High Intensity LEDs To Make A White-Light Illuminator

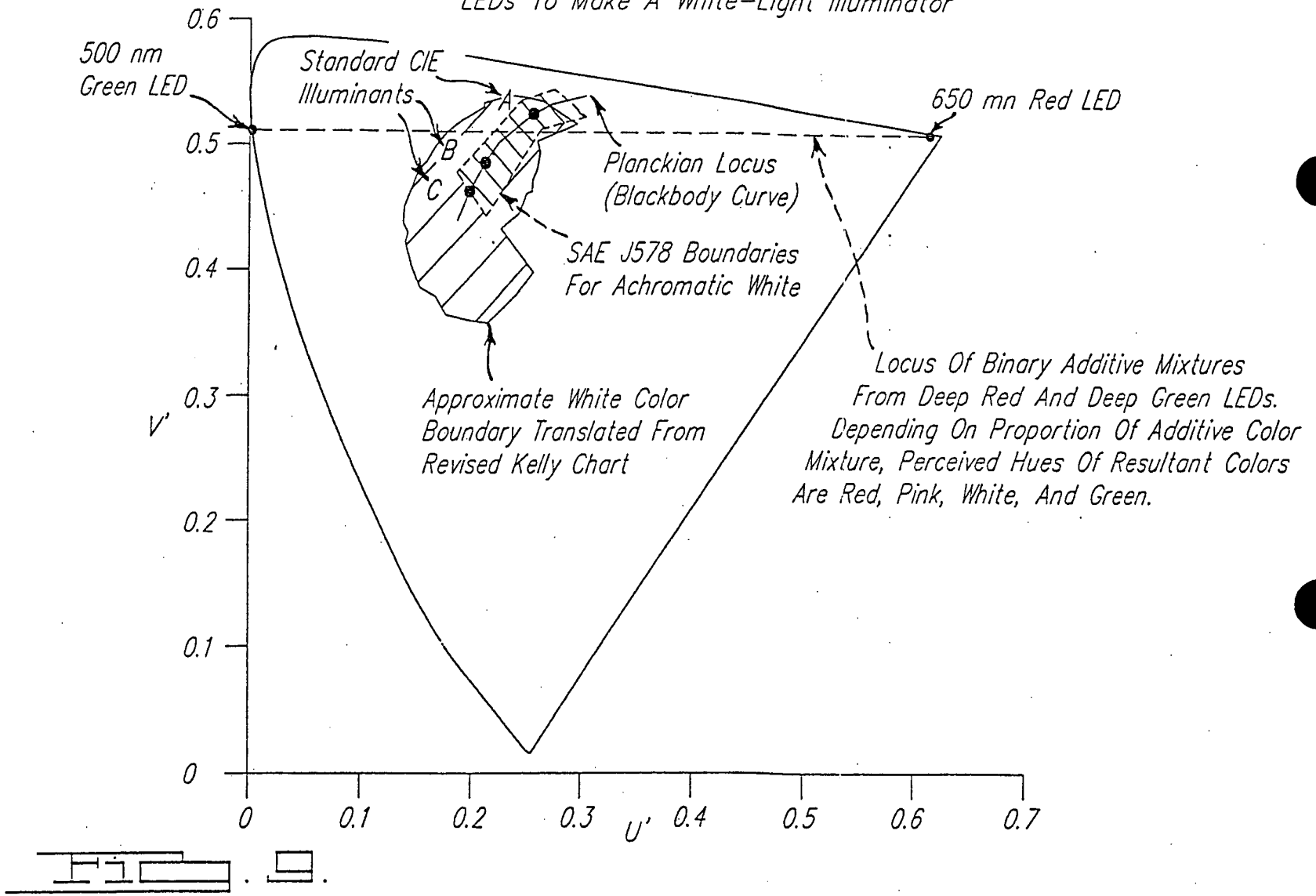


FIG.

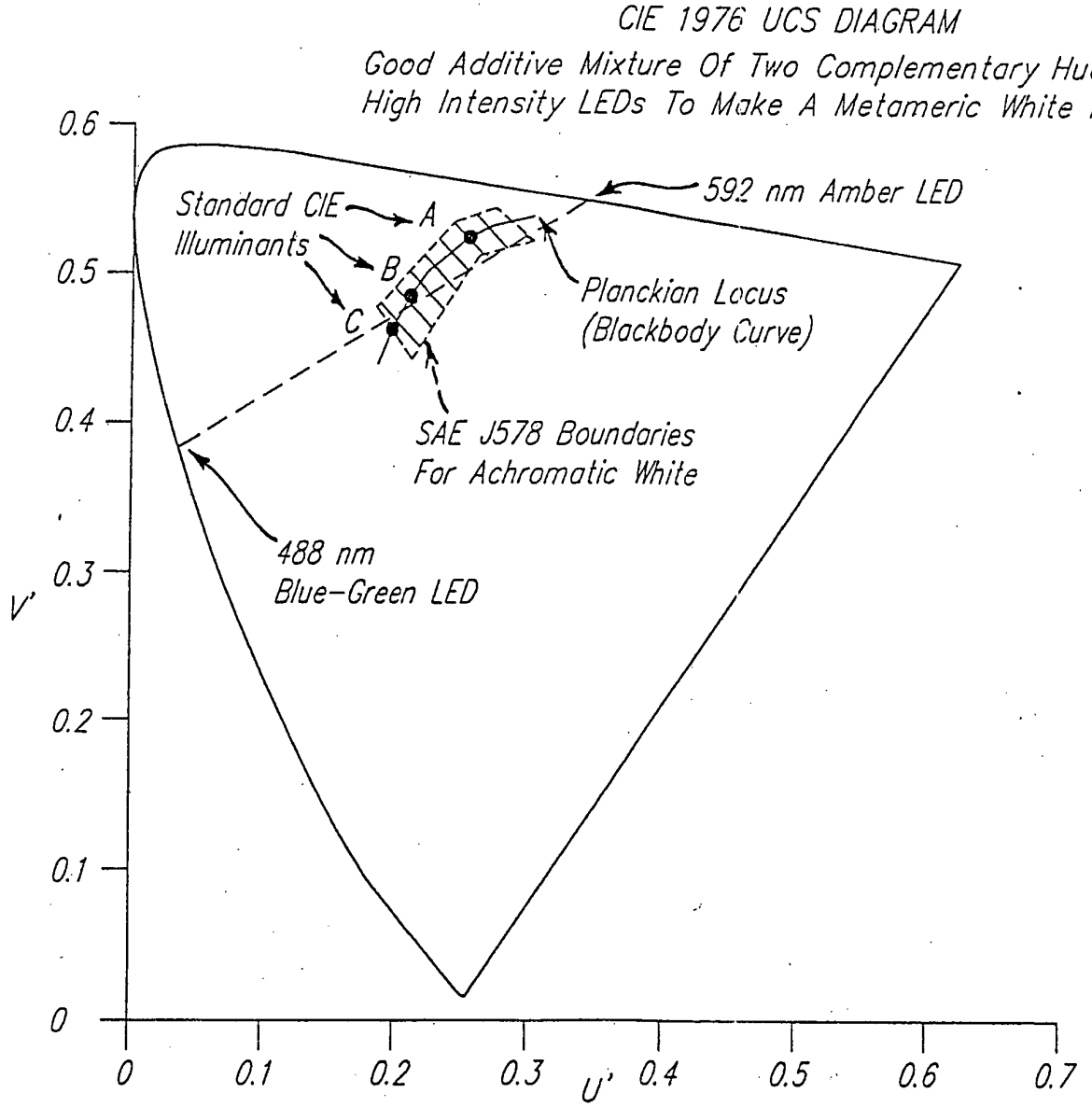


Fig. 10.

CIE 1976 UCS DIAGRAM
Additive Mixture Of Two Complementary Hues From High Intensity LEDs To Make A Metameric White Illuminator (Amber And Blue-Green End-menbers Give Advantageous Tolerance To Individual LED Intensity And Hue Variations)

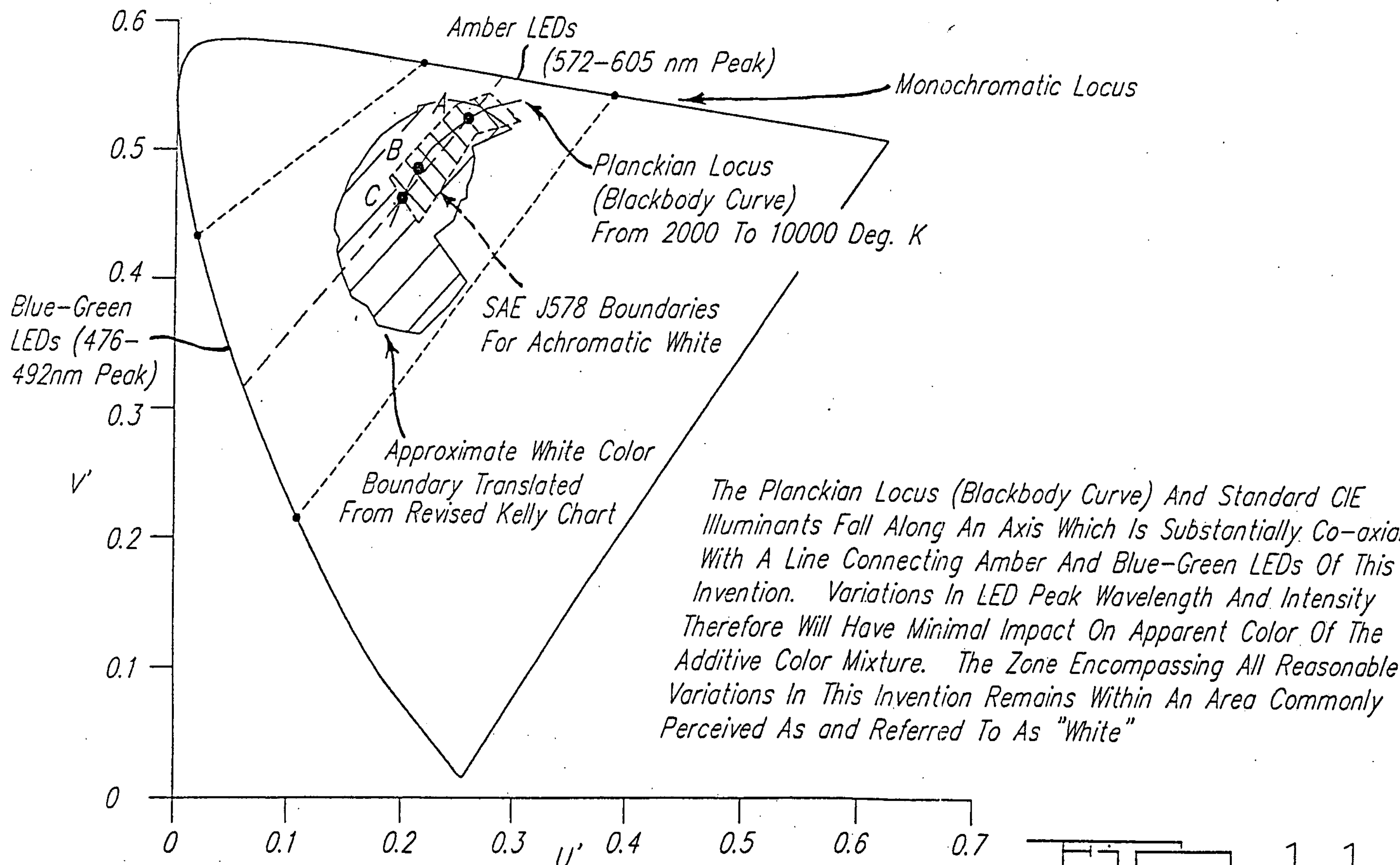


FIG. 11.

CIE 1976 UCS DIAGRAM

Best Additive Mixture Of Two Complementary Hues From High Intensity LEDs To Make A Metameric White Illuminator

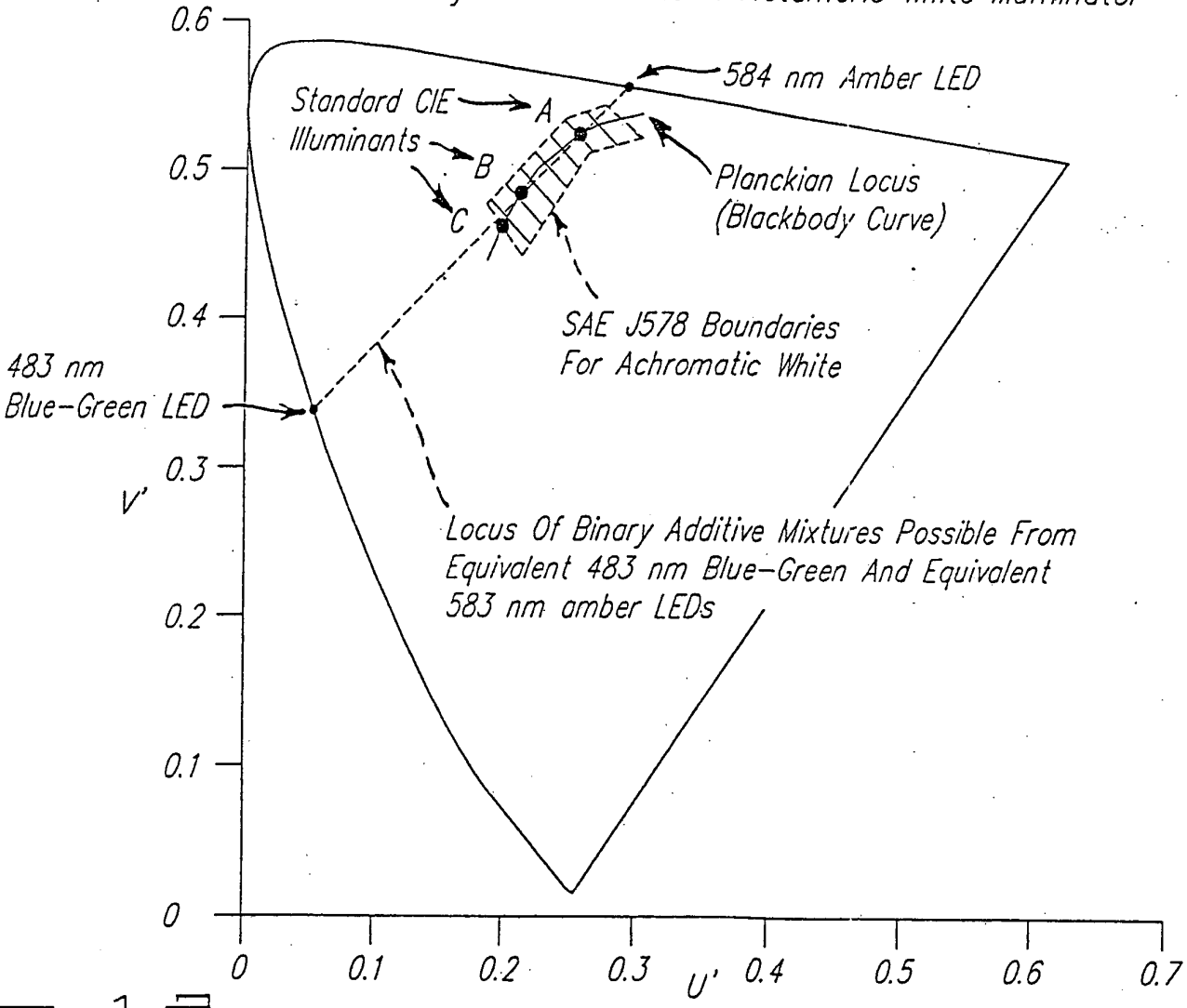
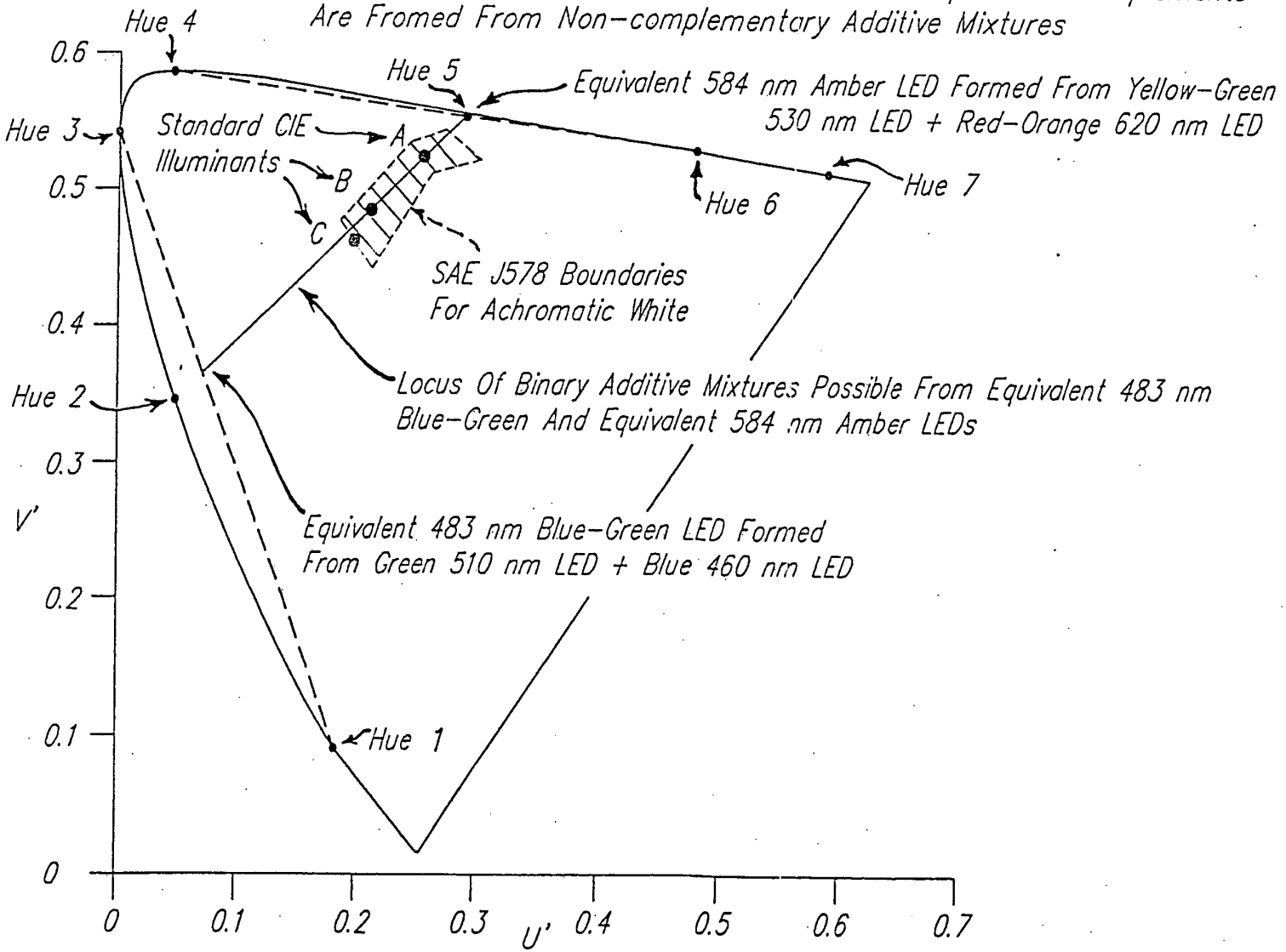


Fig. 12.

Fig. 13.

CIE 1976 UCS DIAGRAM

Additive Mixture Of Two Complementary Hues From High Intensity LEDs In A Metameric White Illuminator Where Equivalent Complements Are Fromed From Non-complementary Additive Mixtures



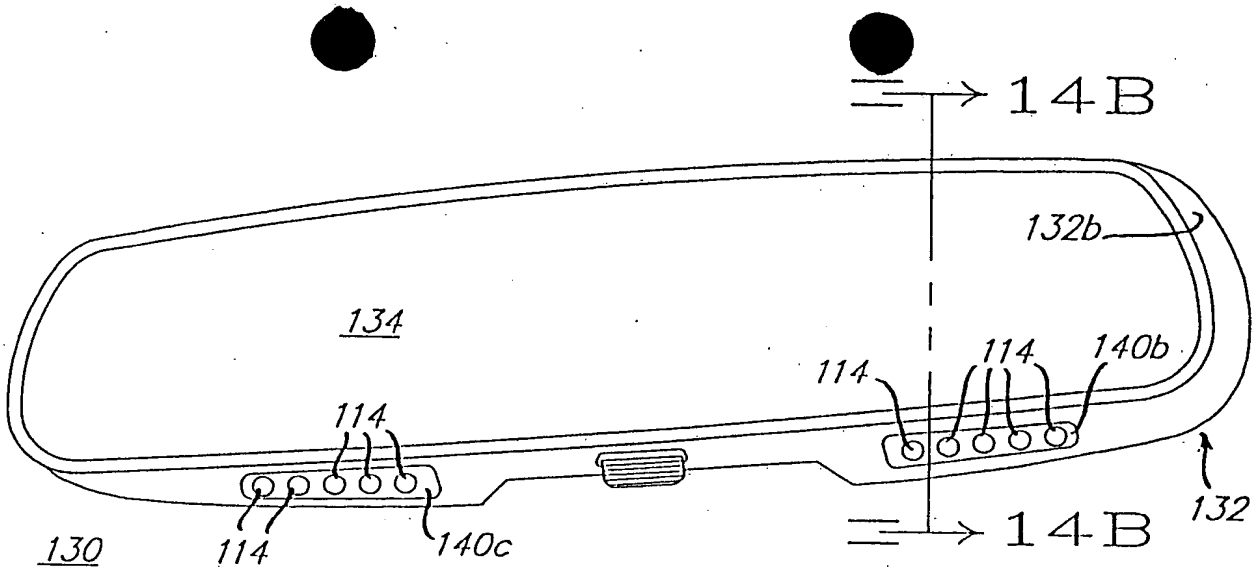


Fig. 14A.

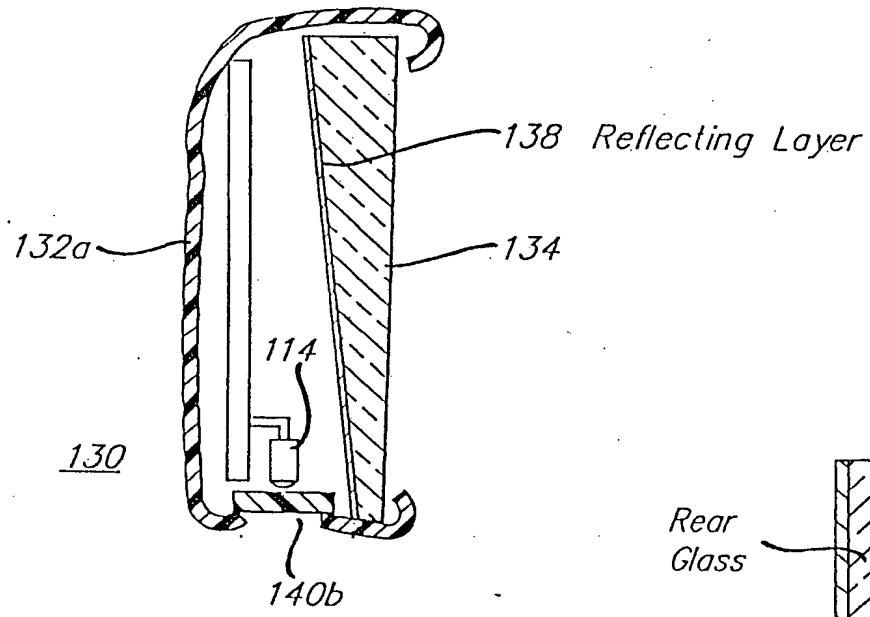


Fig. 14B.

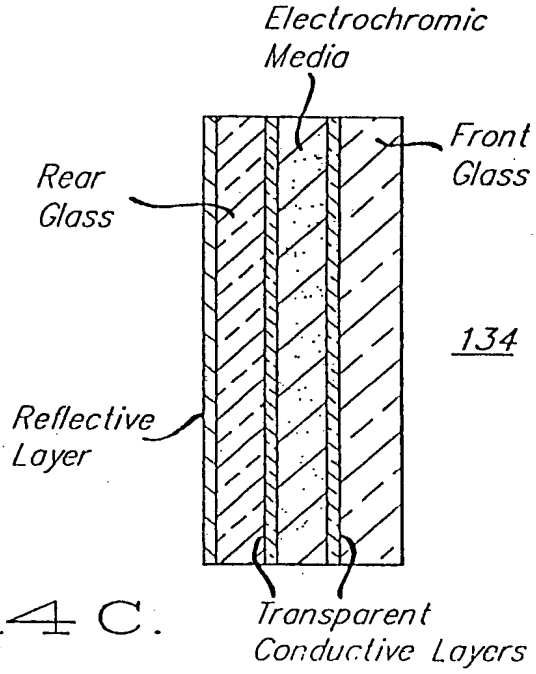


Fig. 14C.

MIRROR WITH INTEGRAL LAMP ONLY

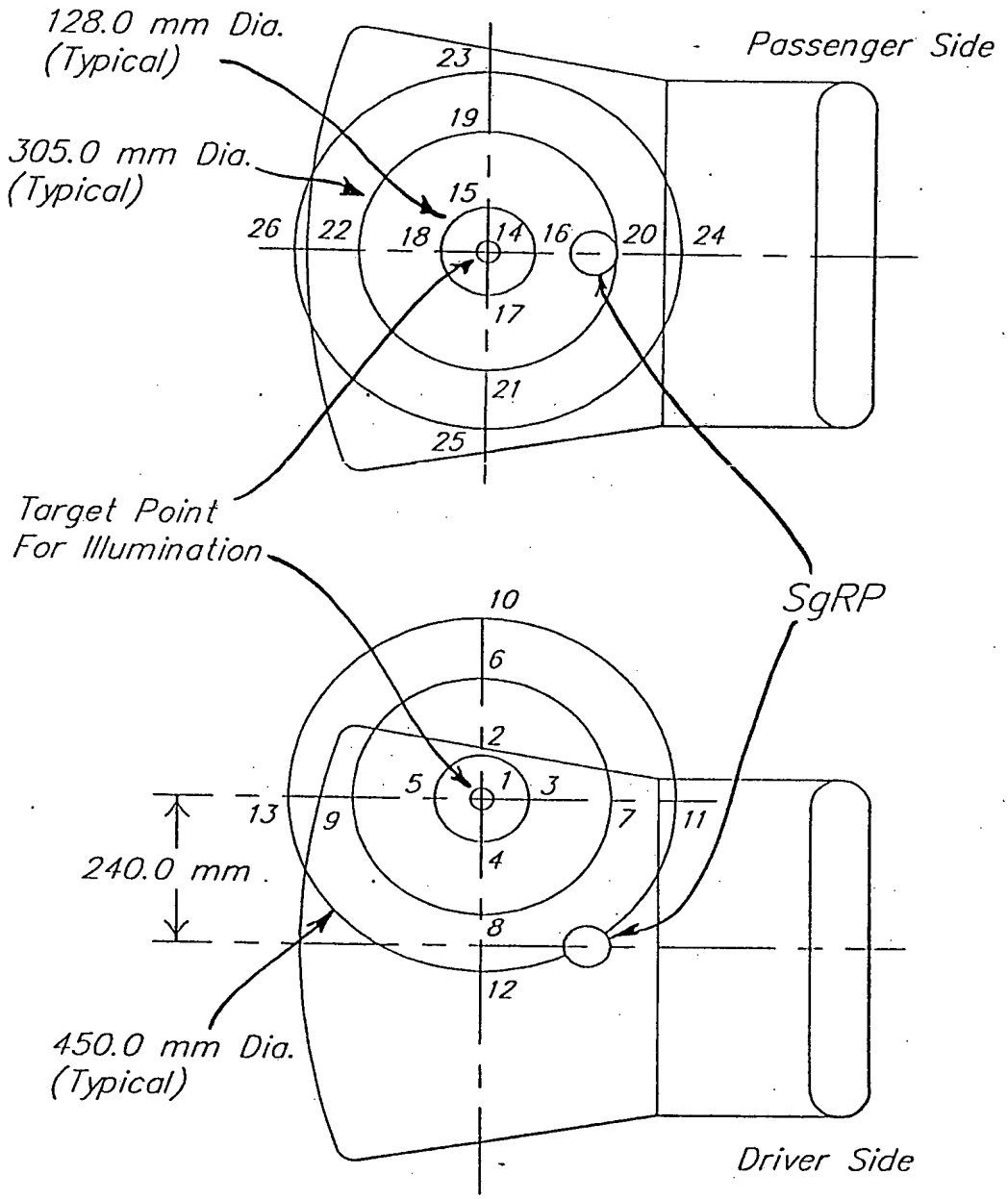
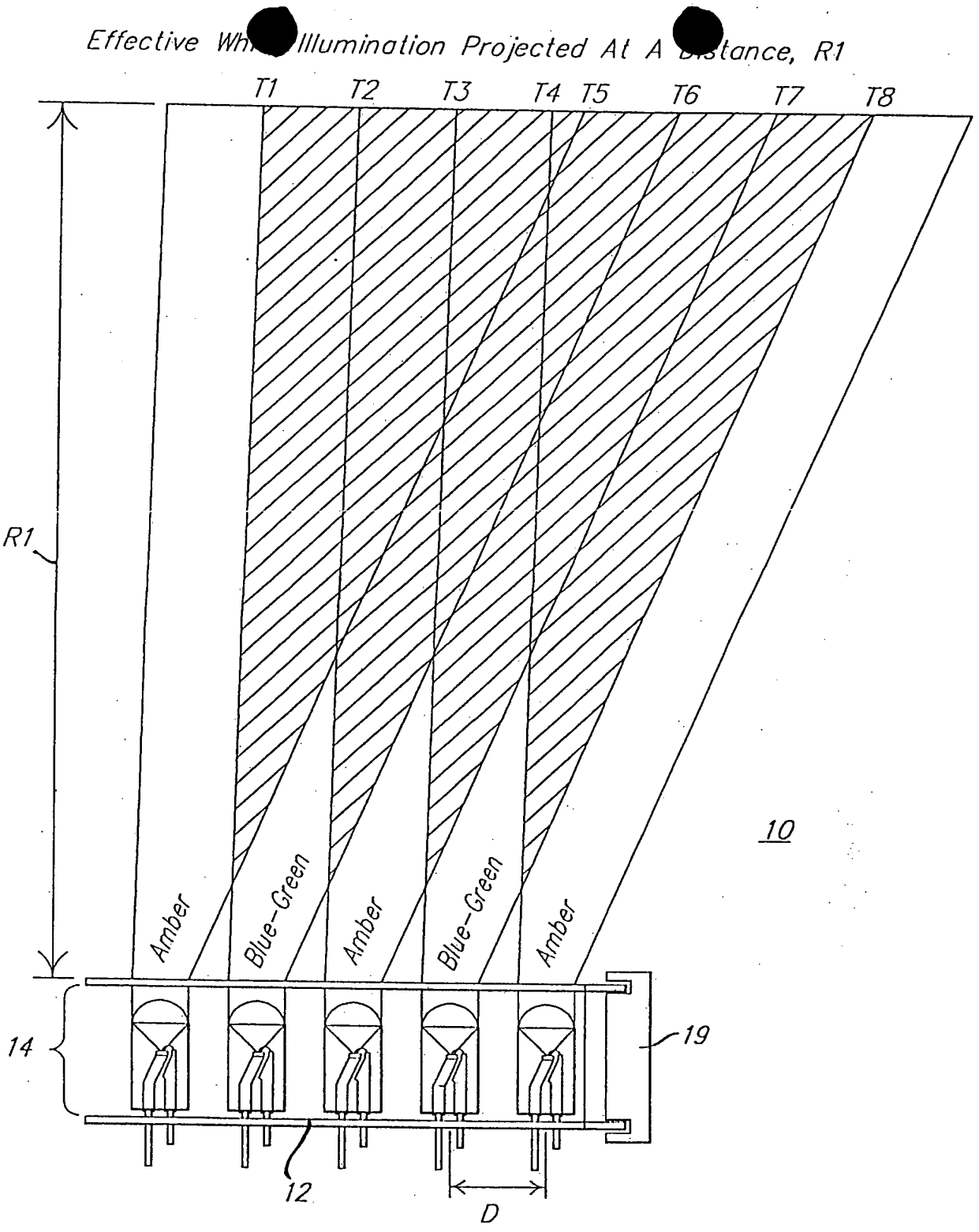


Fig. 15.



$R1 \geq 20 \times D$ (Far Field)

R1 = 22" For Interior Mirror Maplight

D = 0.4 Inches For Interior Mirror Maplight

Fig. 16.

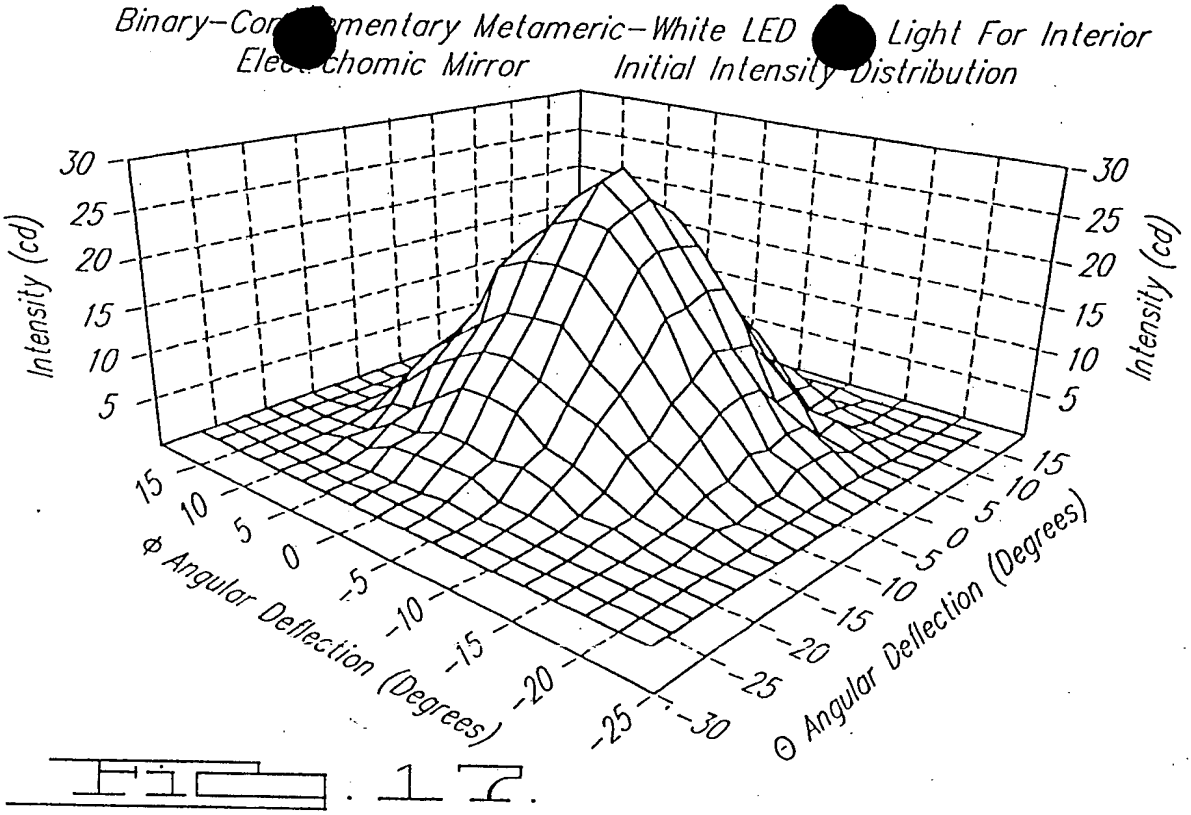

Binary-Complementary Metameric-White LED Map Light For Interior
Electrochromic Mirror Initial Intensity Distribution
Intensity (cd)
30
25
20
15
10
5
Φ Angular Deflection (Degrees)
15
10
5
0
-5
-10
-15
-20
-25
-30
Θ Angular Deflection (Degrees)

Fig. 17.

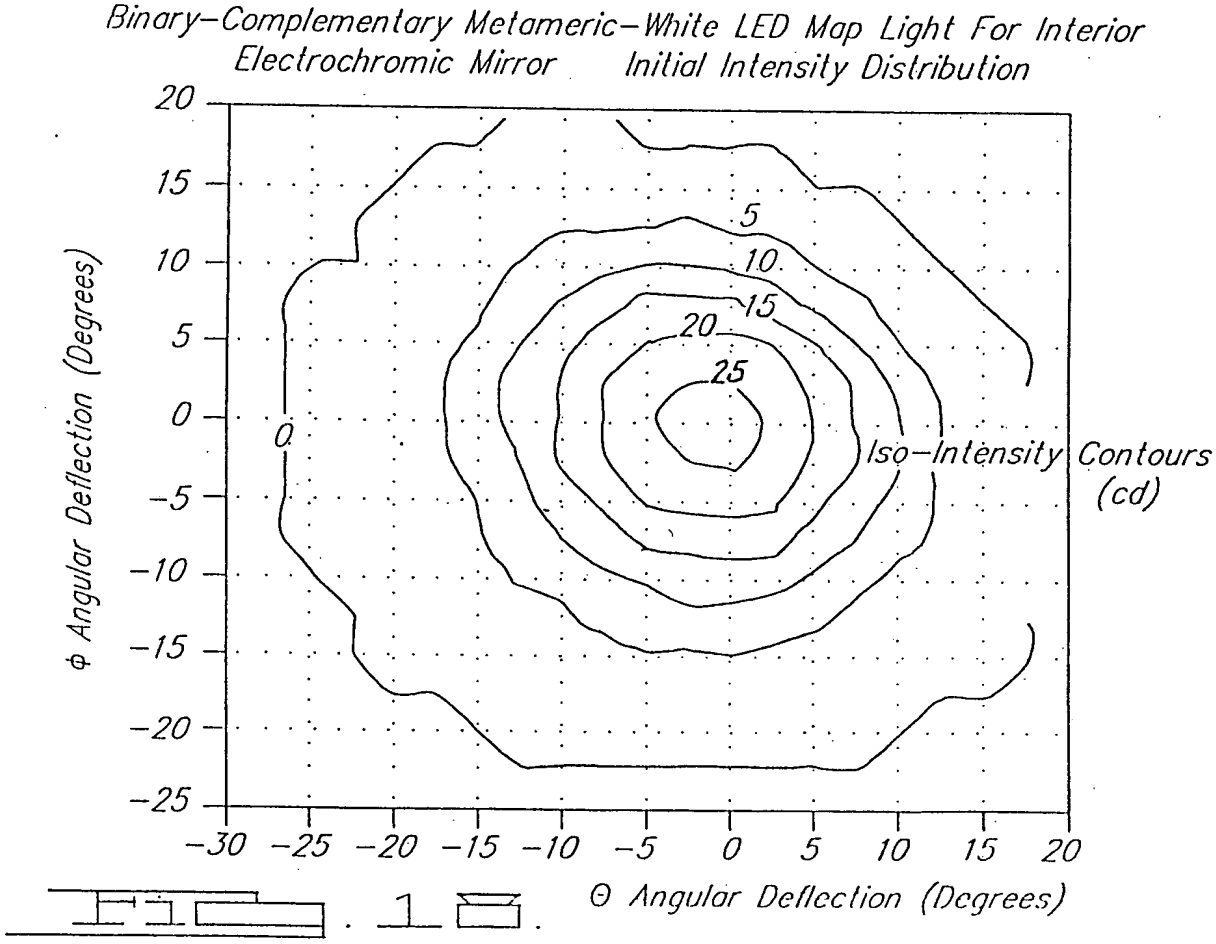

Binary-Complementary Metameric-White LED Map Light For Interior
Electrochromic Mirror Initial Intensity Distribution
Φ Angular Deflection (Degrees)
20
15
10
5
0
-5
-10
-15
-20
-25
-30 -25 -20 -15 -10 -5 0 5 10 15 20
Θ Angular Deflection (Degrees)
5
10
15
20
25
0
Iso-Intensity Contours (cd)

Fig. 18.

Binary–Complementary Metameric–White LED Map Light for Interior Electrochromic Mirror
Intitial Illumination Pattern At Target Distance = 22"

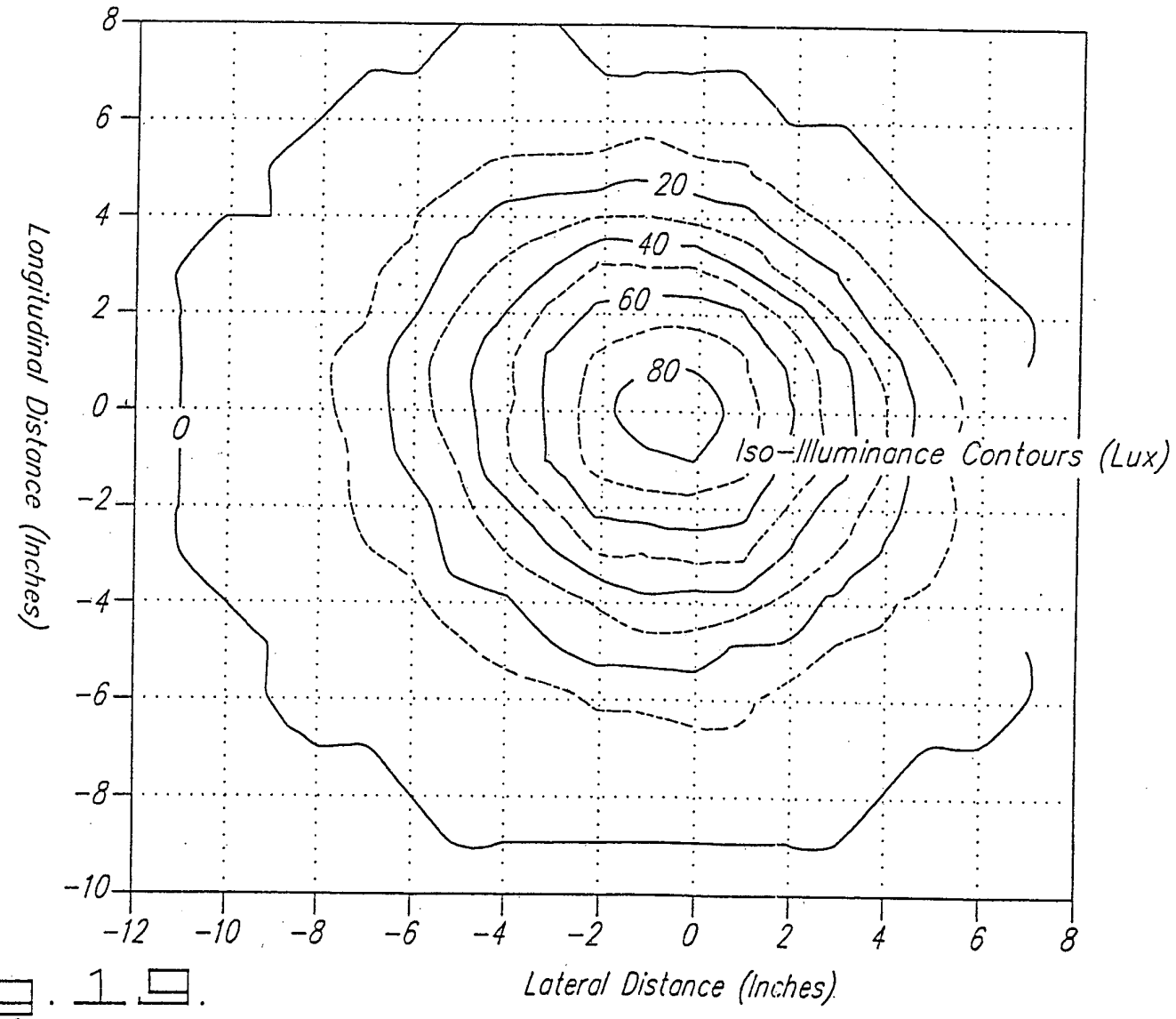


Fig. 19.

Binary–Complementary Metameric–White LED Map Light for Interior Electrochromic Mirror
Initial Surface Luminance Map For 50% Neutral Gray Lambertian Target At Distance = 22"

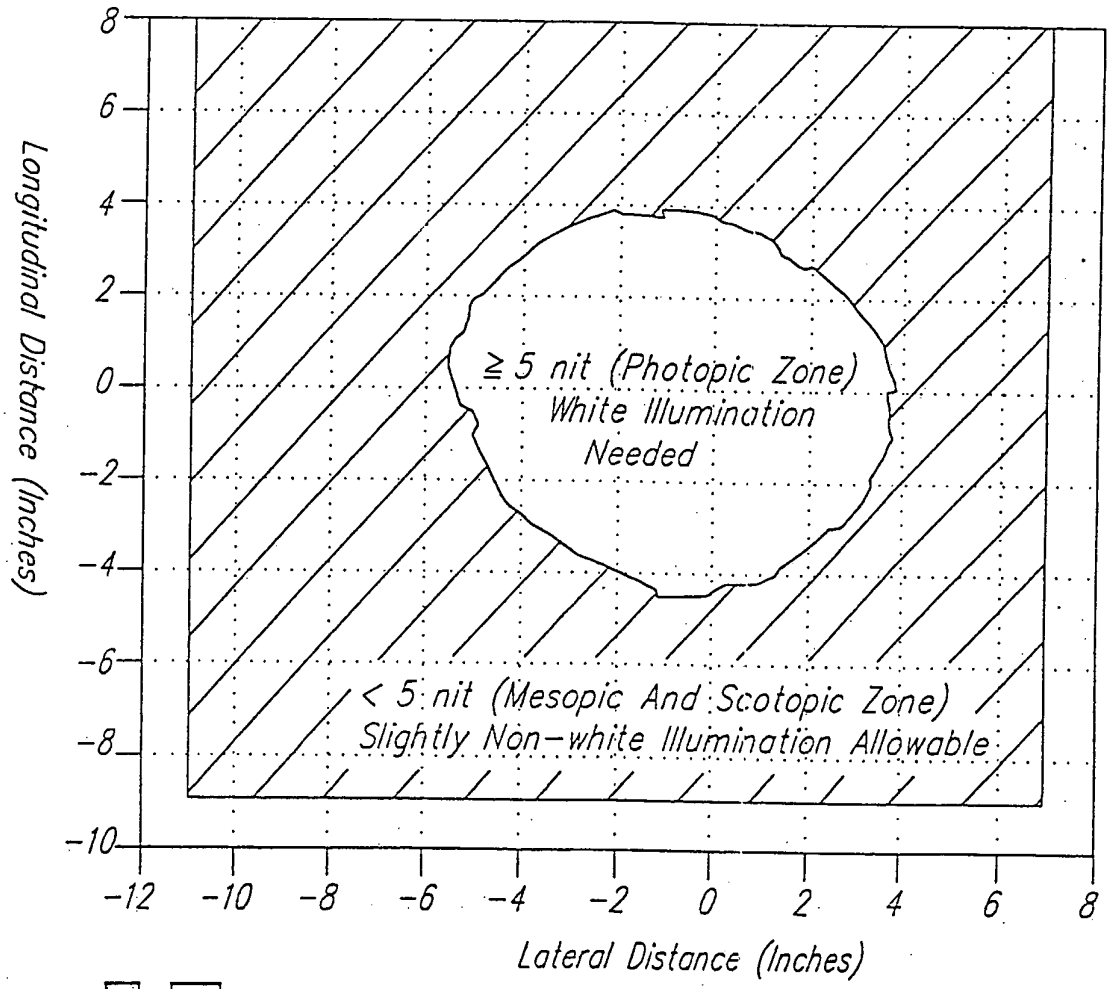


FIG. 20.

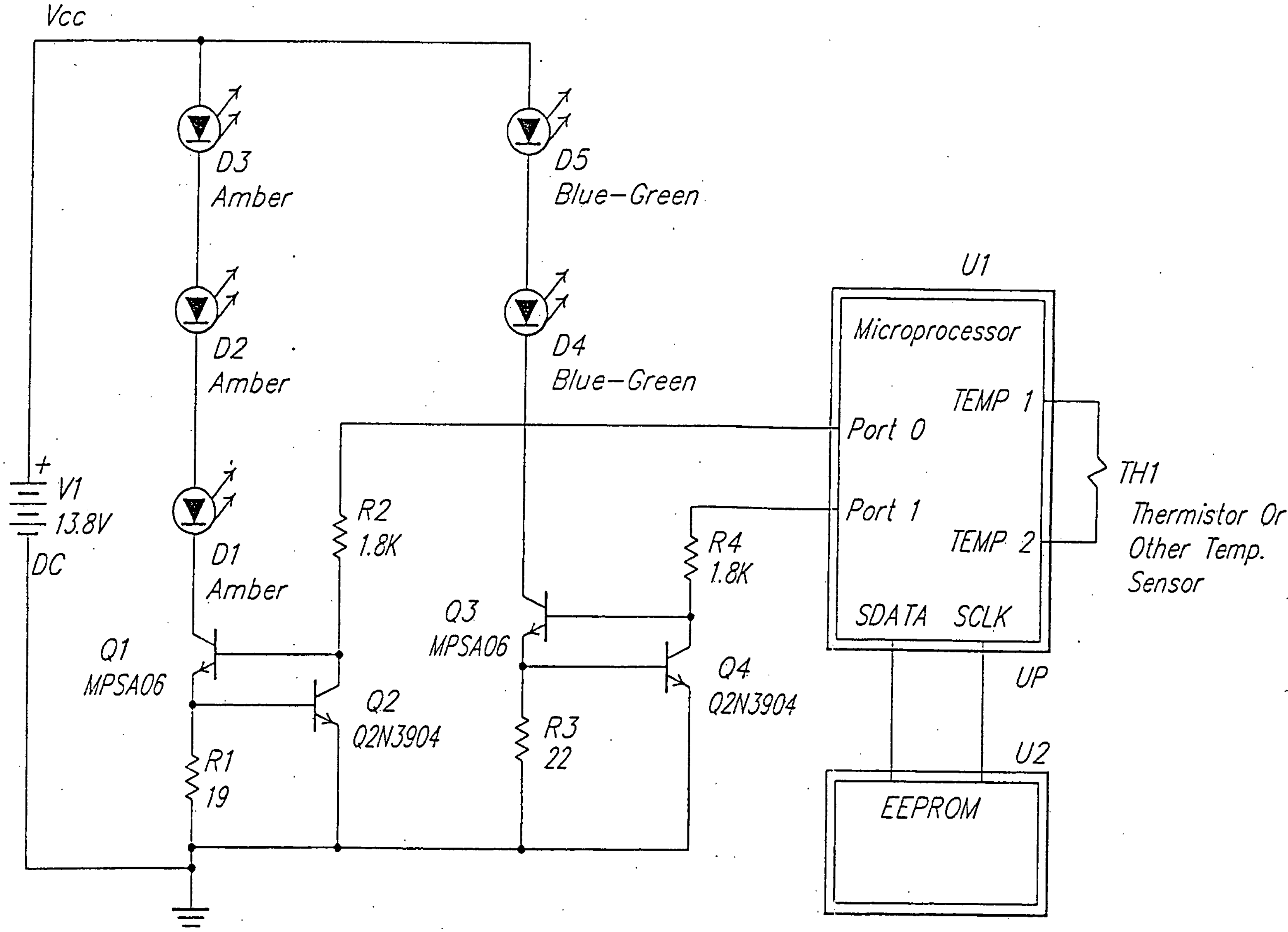

Vcc
D3
Amber
D2
Amber
D1
Amber
D5
Blue-Green
D4
Blue-Green
V1
13.8V
DC
R2
1.8K
R4
1.8K
Q1
MPSA06
Q2
Q2N3904
Q3
MPSA06
Q4
Q2N3904
R1
19
R3
22
U1
Microprocessor
TEMP 1
TEMP 2
Port 0
Port 1
SDATA
SCLK
UP
TH1
Thermistor Or
Other Temp.
Sensor
U2
EEPROM

FIG. 21.

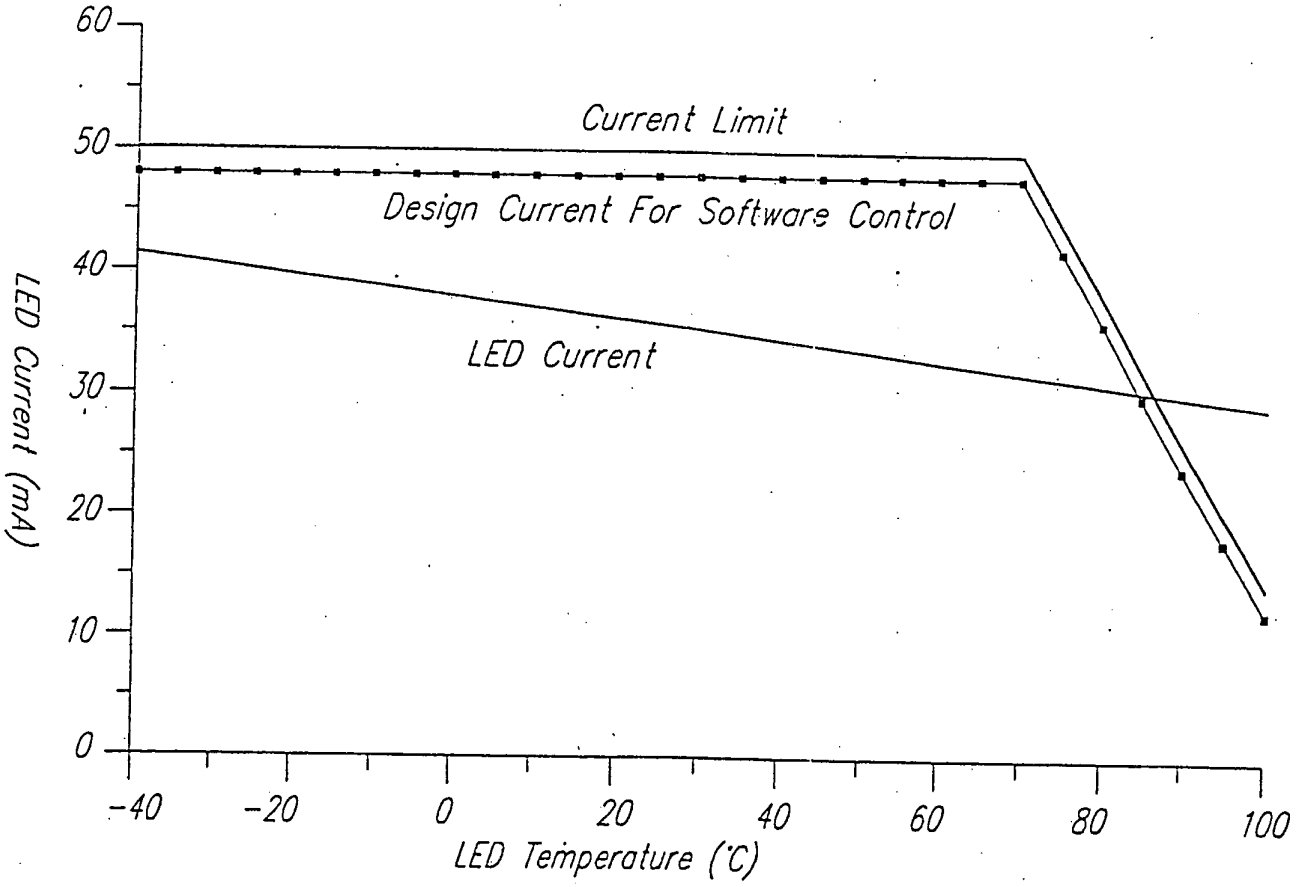

60
50
40
30
20
10
0
Current Limit
Design Current For Software Control
LED Current
LED Current (mA)
-40
-20
0
20
40
60
80
100
LED Temperature (°C)

Fig. 22.

FIG. 23a

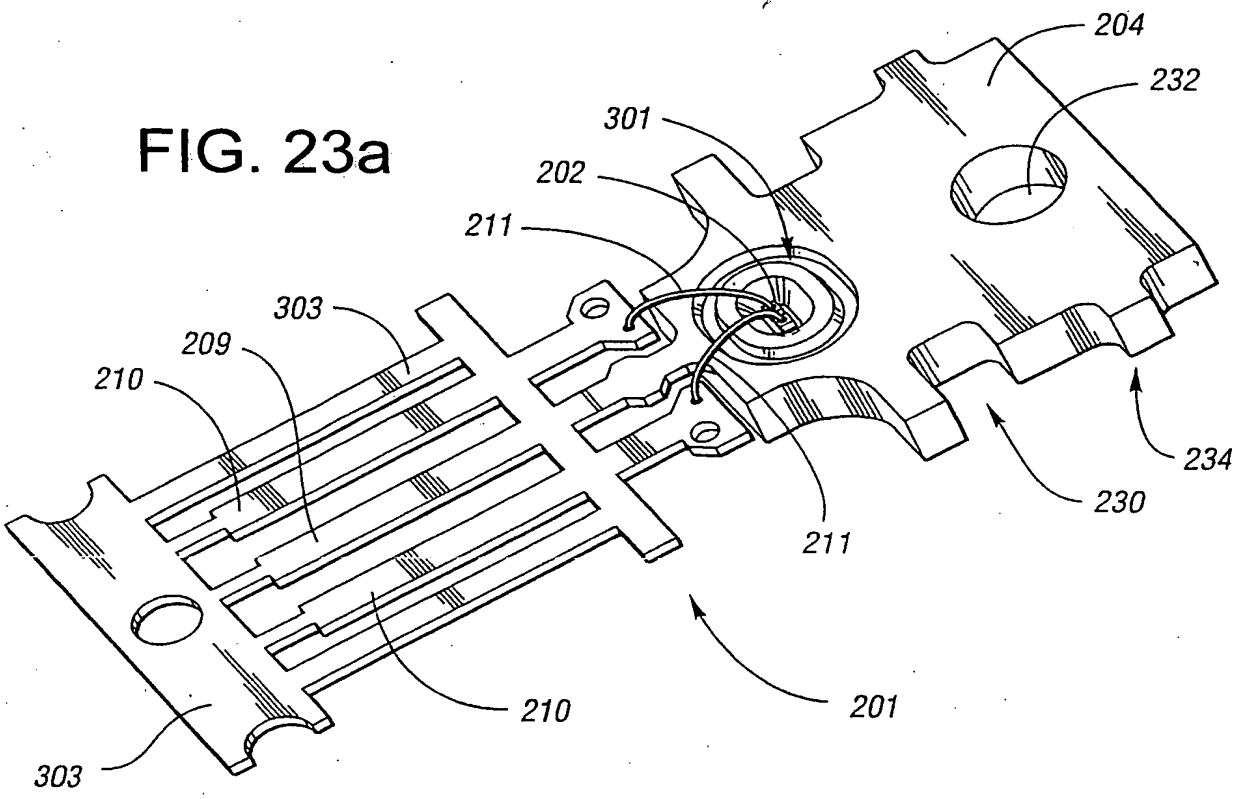
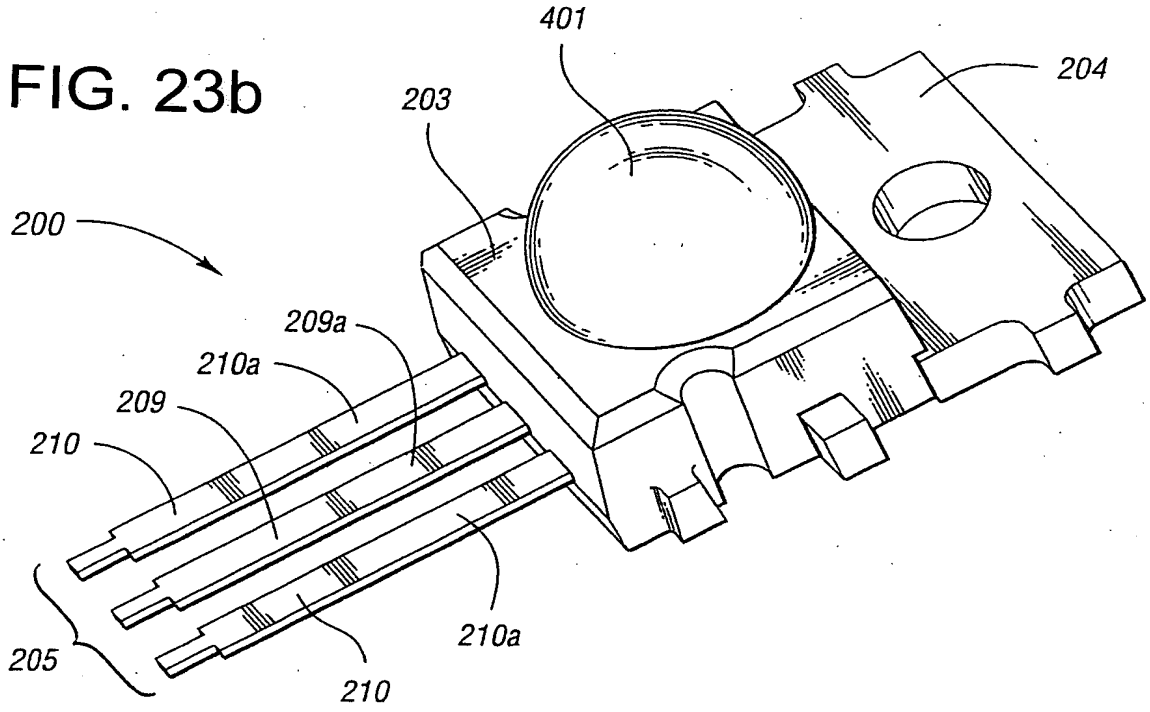


FIG. 23b



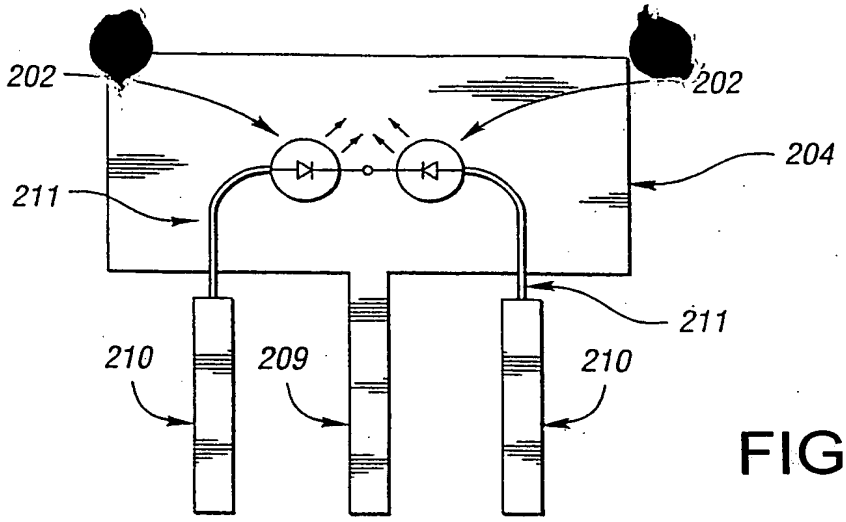


FIG. 24a

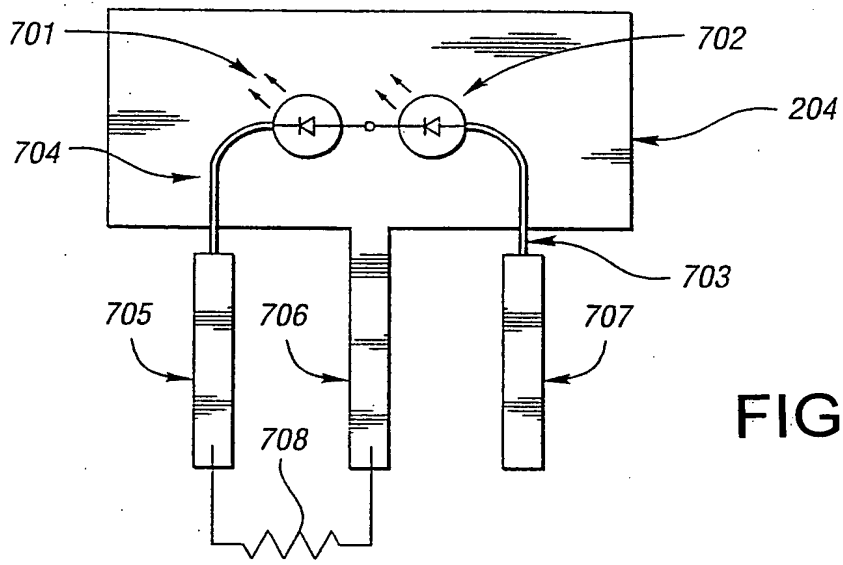


FIG. 24b

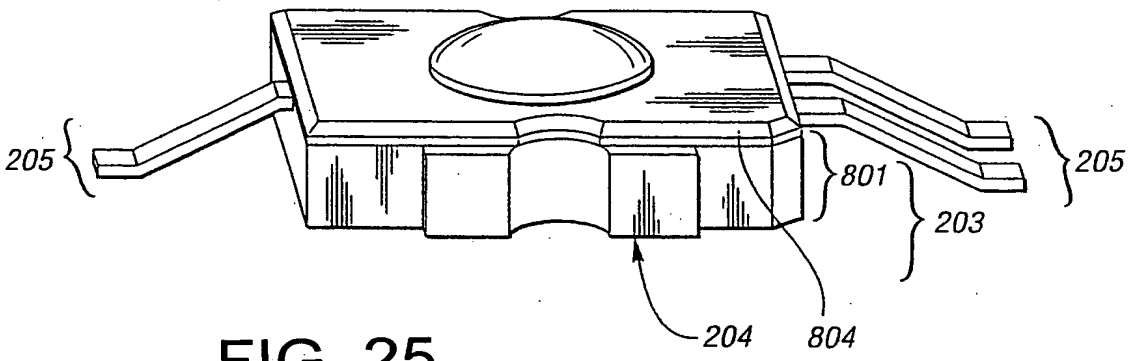


FIG. 25

FIG. 26a

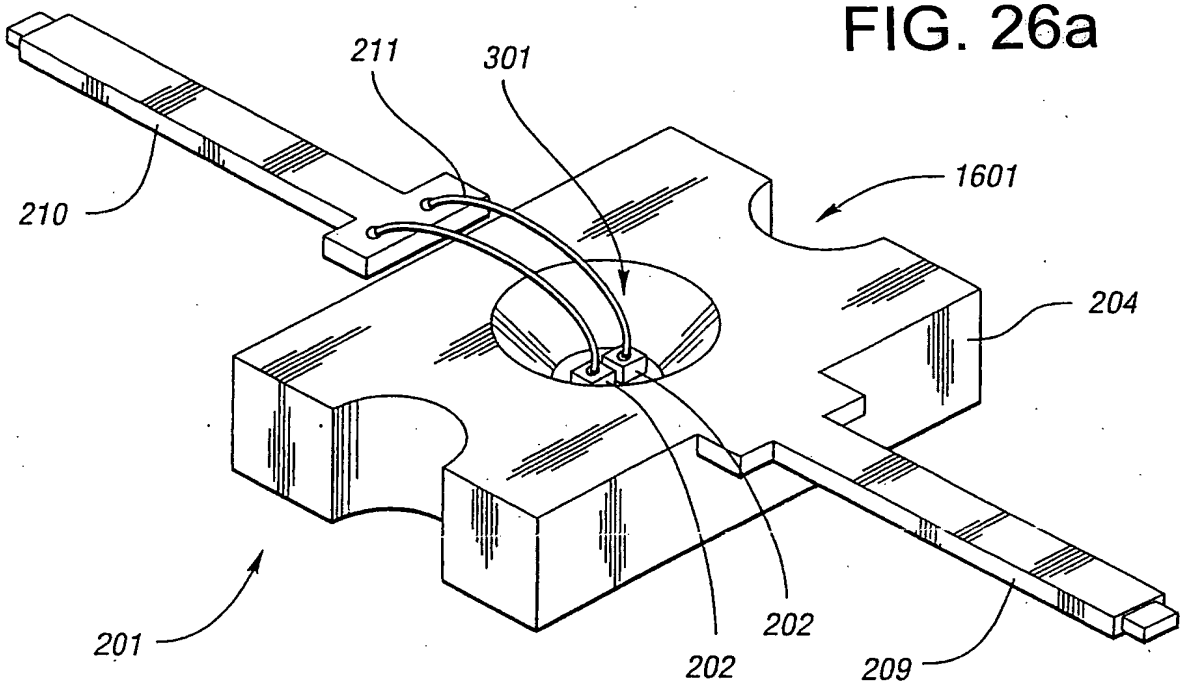
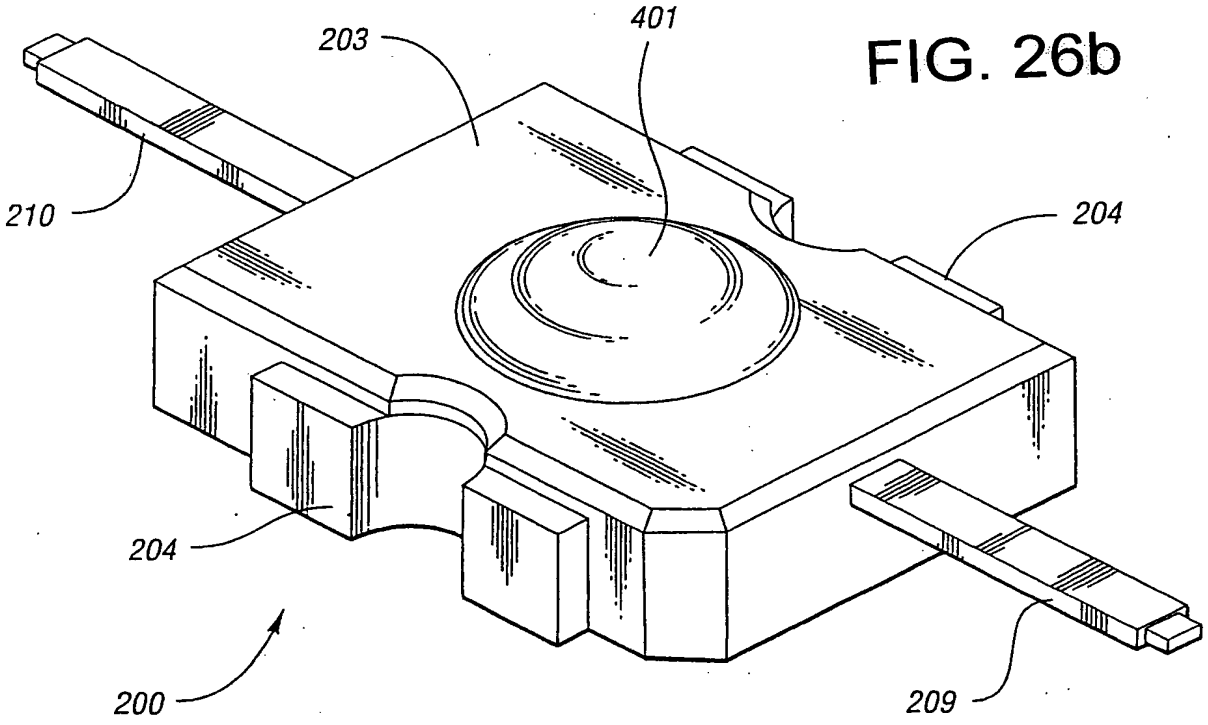


FIG. 26b



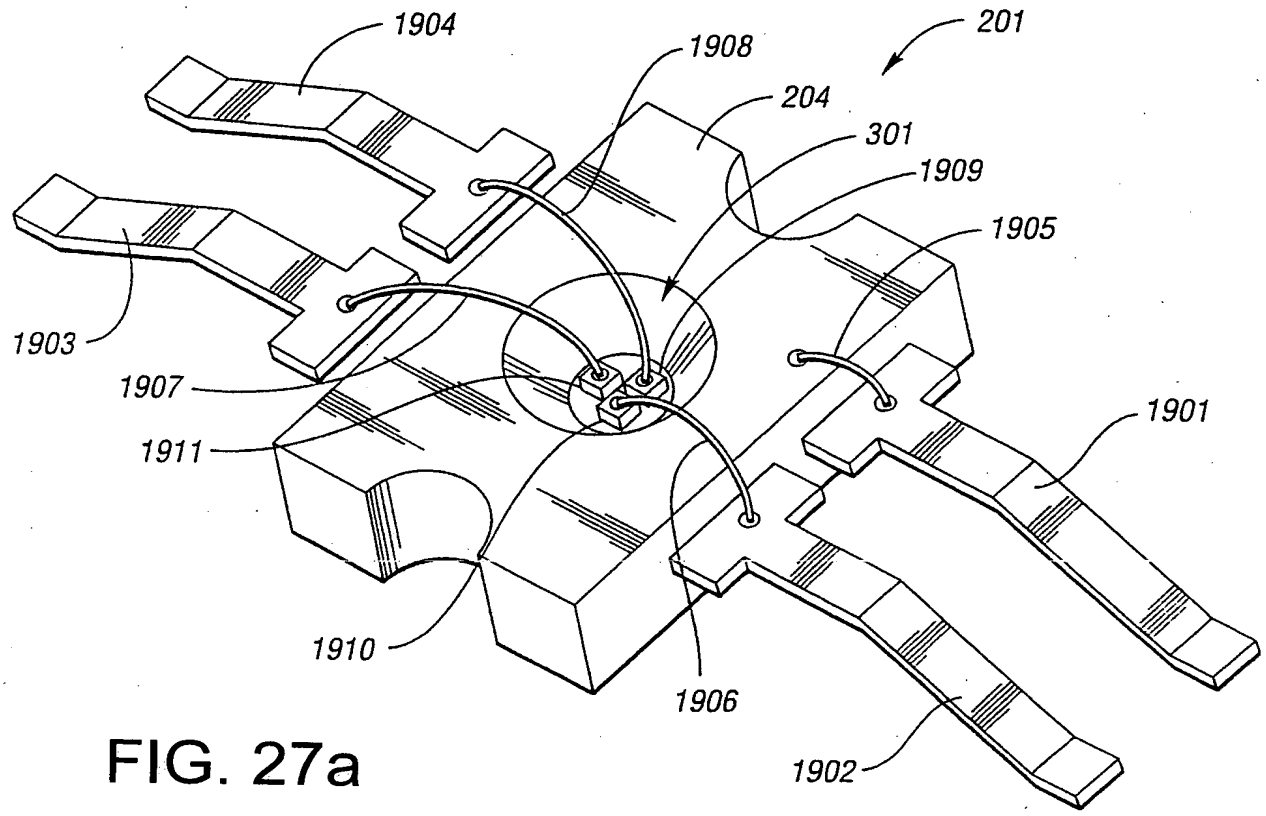


FIG. 27a

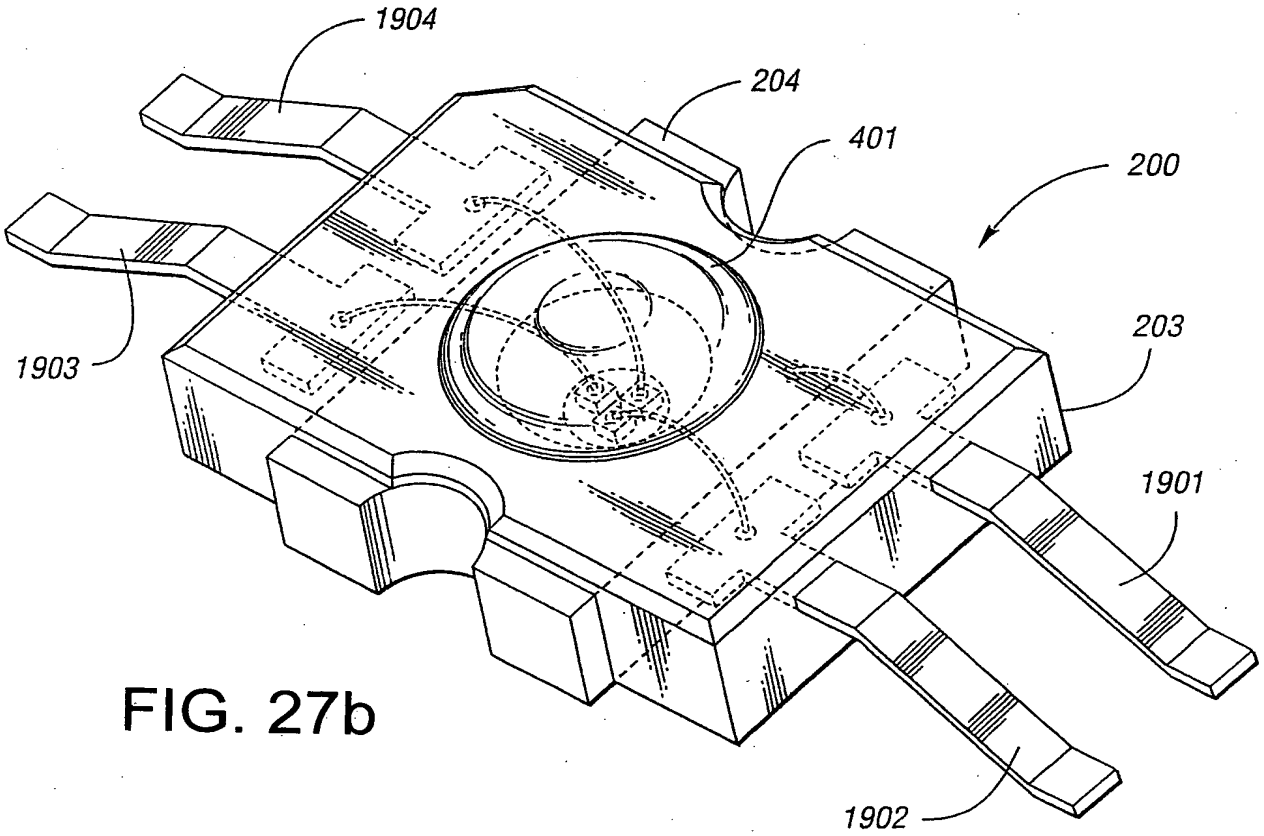


FIG. 27b

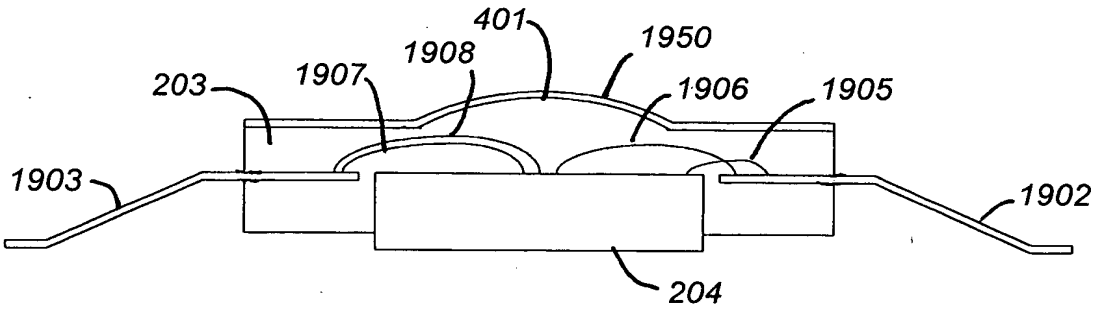


FIG. 28

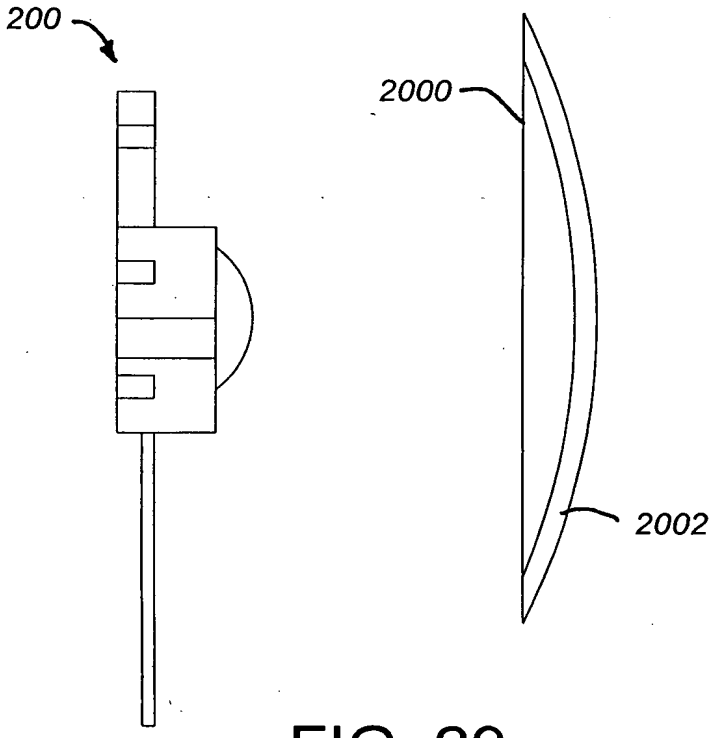


FIG. 29

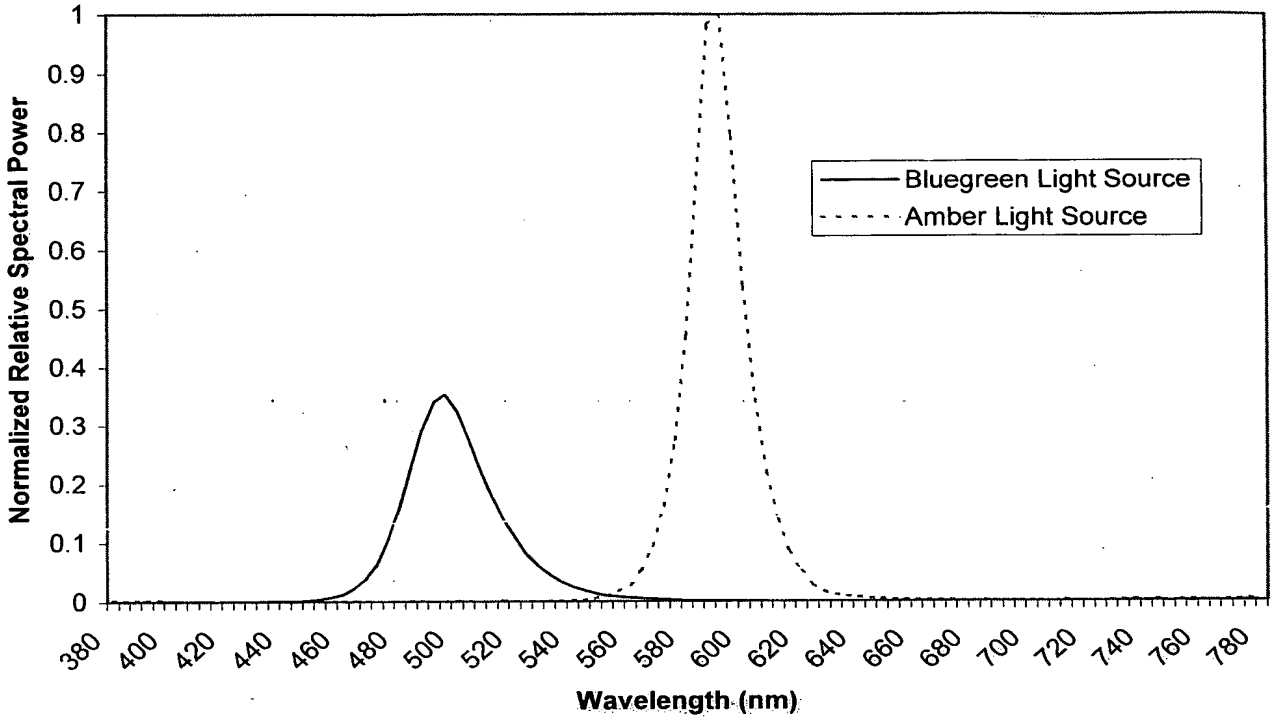


FIG. 30

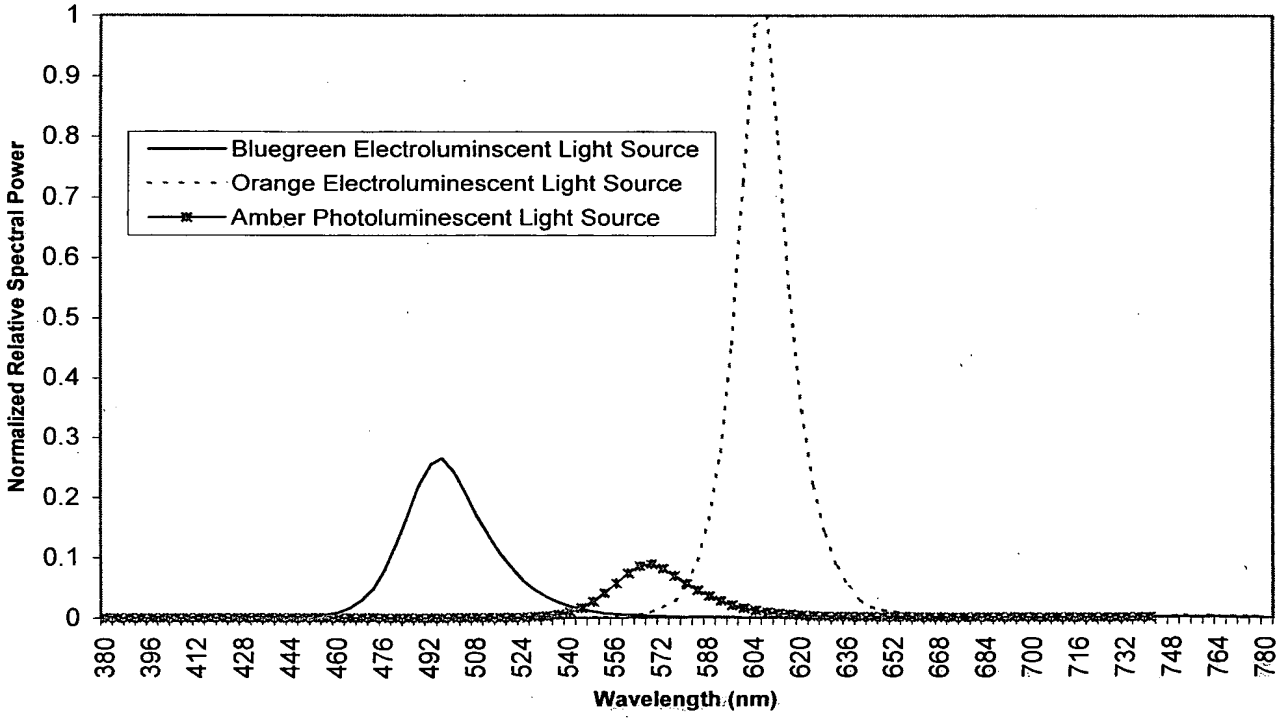


FIG. 31A

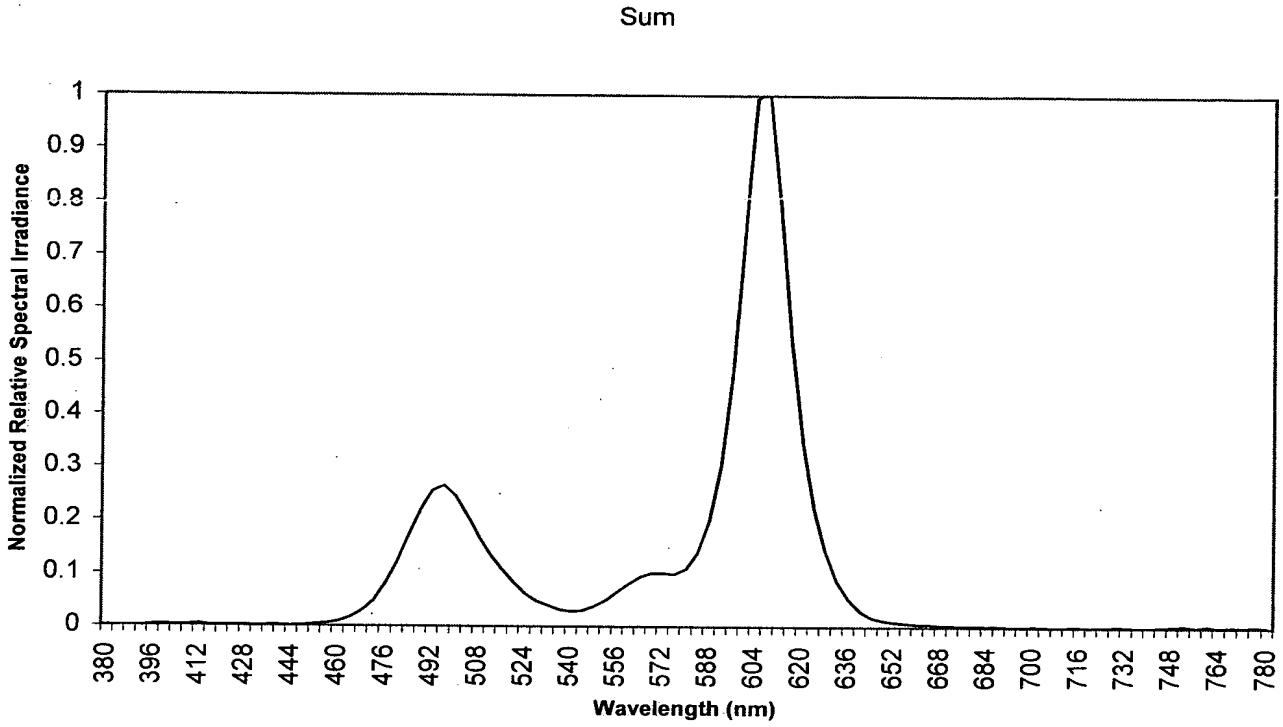

Sum
Normalized Relative Spectral Irradiance
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
380
396
412
428
444
460
476
492
508
524
540
556
572
588
604
620
636
652
668
684
700
716
732
748
764
780
Wavelength (nm)

FIG. 31B